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Management Accounting in Action

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Recognizing first of all that effective use of accounting in the management process requires the reporting of accounting information to be as effective as it possibly can be through the use of a variety of techniques, the author of this article goes on to the many ways in which management may be served by timely and intelligently presented accounting information—and how it is so served in his company. Among the areas specified are: exceptions to the operating plan, pricing, product line composition, alternatives in planning, facilities utilization, cost reduction, and the setting of profit goals.

MANAGEMENT ACCEPTS the cost of the accounting function and recognizes its value when accounting fulfills certain needs of management. These needs of management. which apply to every level are:

1. The need to plan.
2. The need to control.
3. The need to improve.

Management accounting may be defined as the accounting concerned with fulfilling these three needs.

Let us review briefly the usual accounting efforts directed to satisfying the requirements of management. First, the need to plan is recognized in developing long range and short term budgets and forecasts. Other targets of performance, such as cost standards, product profit margins, inventory turnover and return on capital, also fit the planning requirements. Second, the need to control is evidenced by the reporting of performance against the plans and targets. This reporting becomes more meaningful when attention is directed to the exceptions and variations from plan. And, finally, and most important, is the need to improve. This is the "pay-off" area where accounting can contribute most. The accounting techniques used for this are to explain the causes of

exceptions by areas of responsibility and the steps taken toward correction, and to outline possible courses of action.

The management accounting effort at Johnson & Johnson is directed toward assisting every level of management in planning, controlling and improving operations. This objective is accomplished primarily through the issuance of useful accounting information, i.e., reporting. Many of the techniques which are used are standard to American industry. They conform to those described in the N.A.C.A. Research Study No. 28, *"Presenting Accounting Information to Management"*. In setting forth the picture of management accounting in action against both a general background and the specific one afforded by our company, the remainder of this article will consider principles of reporting, techniques of reporting applied in our company, and how, through these, the needs of management for information are met.

Principles of Reporting

Accounting communicates with management through the medium of reports. An exact definition of reporting is hardly necessary. But let us agree that good accounting reports can be formal or informal, written or verbal, typed or handwritten, and they can be bound, stapled, etc., or on a single sheet of paper. Although the form of a report is not nearly as important as the contents, the form must be one acceptable to the recipient. Otherwise, the report will be prejudged as to its contents and will receive little consideration. As to character of contents, any discussion of reports to management must include principles as well as techniques. Reports should be timely, clear, concise and complete. These are fundamental principles. Other principles which must be observed, if maximum benefits are to be achieved, are equally important and not so well known.

Reports should be expressed in simple, understandable terms. Much emphasis has been placed in recent years upon the semantics of communication and accounting terminology has received its share of attention. The committee on terminology of the American Institute of Accountants has helped by suggesting simplified terms for "surplus," "reserves" and other expressions used in financial reports. Similar steps towards simplification have been taken in the use of industrial accounting terminology such as "unabsorbed burden," "overhead variance—debit or credit", and other terms familiar to the industrial accountant but often confusing to others.

Reports should clearly distinguish between fact and opinion. This is a principle which is self-evident but, unfortunately, writers of reports sometimes present

personal opinions as fact. If a report is to receive attention, the distinction must be observed. Management relies upon the accountant for independent, impartial reporting. The accountant's opinion may be as helpful as his findings but the two elements should be separated in a report.

Reports should be directed to the knowledge, interest and responsibility of the recipient. A common example of application of this principle, recognizing different levels of interest, is in the reporting of production cost information. The foreman should receive a report pertaining to his department. The plant superintendent should receive a summary of the reports issued to the foremen under his supervision. The vice president in charge of manufacturing should receive a summary of the reports issued to the managers under his direct supervision. At each one of these levels, there are different areas of knowledge, interest and responsibility. These different levels also, require different time schedules of reporting. The foreman is concerned with daily operations. The plant superintendent is interested in weekly performance. The vice president is more concerned with long-term operations in monthly and trend reports.

Reports must serve a useful purpose. They should convey useful information of importance to the recipient or disclose specific data that require decision and action. It is often necessary to inquire whether a report is still useful. All of us share the experience of having issued a report in answer to an expression of interest and of continuing to issue it long after the interest has been served. One way to minimize the possibility of this is to survey periodically the reports being issued to determine the need for them and requirements as to number of copies, frequency of issue, and adequacy of form and contents.

Reports should be interesting. How, you ask, can a column of digits be made interesting? A quick answer may be to omit the column of digits. More to the point are such devices as:

Use of color.

Insertion of pictures, charts and graphs.

Use of simple, short phrases in clear, bold type.

Presentation in visual form by projector and screen, or by flip-over pages.

Issuance of brief reports accompanied by verbal interpretation.

Making reports interesting is a challenge to the reporter's imagination and creative ability.

Reporting by exception is a well-accepted principle for improving the usefulness of reports. When plans are well-conceived and accepted, only the variations from them are important. This principle is especially useful in any reporting of performance. Here the difference between performance and standards, budgets and other predetermined yardsticks is the significant information which requires attention.

The above listing of principles of reporting is by no means complete. A very important factor, which takes precedence over all others, is *the judgment of the reporter in applying the principles to the circumstances.*

Factors Affecting Reporting at Johnson & Johnson

The subject of reporting has special interest to accountants because of the many variations in the techniques that are used. The techniques differ from company to company and those that are successfully employed in one company may fail when used in another. These variations can be attributed to the differences in:

1. Type of industry.
2. Management composition, interest and knowledge.
3. Organization structure.
4. Method of operation.
5. Product line.
6. Profit margins.
7. Accounting methods and procedures.
8. The reporter's concept.

The reporting techniques used at Johnson & Johnson are influenced by many of these factors. In particular, the composition of our management, the company's program of budgets and forecasts, and the type of industry and product line affect our reporting.

To take these in turn, the composition of the management organization is an important factor in reporting of information which is common knowledge to the operating management. Our management personnel consists entirely of internal operating executives. The management board, responsible for the operations of the parent company, includes the president, the functional vice-presidents, the corporate controller and assistant treasurer, and the operating controller. Officially this board meets once a week. Unofficially the members meet daily. Any event which may result in a significant change in planned operations is communicated promptly without the necessity of a formal, written report. The result is that we do a minimum of regular, routine reporting. In its place, we issue special reports in which exceptions from plan are explained and from which action can be expected.

Our accounting methods and procedures include a complete program of budgets and forecasts under which the company operates. This program requires the participation of every foreman, supervisor and department head. The final amounts reflected in income and balance sheet forecasts are submitted to top management for review, approval and acceptance. Such a program channels and greatly simplifies the reporting function. For example, in reporting financial condition and income, more emphasis is placed on budgets and forecasts than

upon actual results. The review of the annual budget and forecast, early in January of each year, is an extensive report of past, current, and forecast data presented in about 30 visual charts and graphs. Invariably this presentation generates many questions and much discussion. Quarterly budget revisions are reviewed in less detail. In view of the extensive coverage of budget information, the reporting of actual amounts is after the fact, generally confirming the budget data. It follows the exception principle.

The third of the characteristic influences on our reporting was identified above as type of industry and the product line. Johnson & Johnson manufactures an extensive line of surgical dressings and baby products. Fundamentally, they are consumer products distributed through established trade channels at fixed prices. Because the two principal factors affecting monthly income are sales volume and sales mix, prompt reporting of monthly income is dependent upon the early release of monthly sales data. Since standard costs are used, the calculation of cost of sales and gross profit is readily accomplished. Special reporting of abnormal variable expenses incurred in the month and the use of budgeted amounts for all other income factors quickly produce a monthly income statement. This is the procedure we follow in issuing an income statement on the fifth working day of the month following. Our monthly financial report is a one-page statement of income data, with brief comments on the differences between results and budget. Quarterly reporting is more extensive.

The length of the product line and the extent of the differences in products also have an important bearing on the accounting detail and complexity, including reporting. Johnson & Johnson makes about 1,200 different "put-ups", classified into 60 product groups. This broad line of products supplies opportunities for management accounting in such areas as selling prices, costs, profit margins, return on capital employed, line simplification, volume alternatives, direct vs. allocated costs, and many other considerations which require accounting participation. Some of these areas are explained in more detail in the following paragraphs. The possibilities of accounting service to management in the field of product analysis are limited only by the cost and availability of the personnel and their imagination and ability to do the job.

Management Accounting to Improve Operations

As stated at the start of this paper, the final and most important need of management is the need to improve operations. This is the area in which management accounting can make the most important contribution. To be successful, the accounting effort not only has to use the best of its technical skills and

imagination, but it also has to secure the complete acceptance of the other functions of the business, especially those being measured and evaluated. In order to minimize conflict of interest which could delay or nullify the attainment of the objectives, the accountant has to avoid any trace of critical attitude and emphasize cooperative assistance, even to the extent of subordinating to the achievement of the common goal his desire for recognition.

Production, engineering, research, purchasing and accounting—each function standing alone can make its individual contribution to profit improvement. When they merge their interest and join together, the results can be amazing. This team spirit is the source of our most successful accounting efforts. The following examples of the accounting contribution to profit improvement at Johnson & Johnson are offered as illustrations of the possibilities of management accounting. Similar opportunities in other companies would depend upon recognition of the particular impact of many of the factors previously referred to in this paper. The examples to be given reflect the efforts we have made in the following areas:

1. Reporting exceptions and suggesting corrective action.
2. Assisting in arriving at product prices.
3. Improving the product mix.
4. Simplifying the product line.
5. Evaluating alternative courses of action.
6. Making maximum use of production facilities.
7. Participating in cost reduction programs.
8. Setting the profit goals.

Reporting Exceptions and Suggesting Corrective Action

The best example I can offer of the reporting of exceptions and of suggesting corrections is the control costing program developed by our cost division. William Langenberg, assistant controller in charge of budgets and costs, has described some of the techniques used in control costing in an article on the subject in the June 1955 issue of the *N. A. C. A. Bulletin*. A similar description is included in the American Management Association's publication describing our program of Financial Planning and Control, *Financial Management Series No. 110*. Briefly, the control costing program is an extension of standard cost accounting techniques, in which emphasis is placed on the detailed reporting of material, manpower and machines. The detailed reporting is expressed in physical terms directed to the understanding and interest of the operating foremen and supervisors.

Material losses are identified by specific items and specific costs. The total loss of material in production includes the loss allowances provided in standard costs. In other words, attention is directed not only to the variance but to the total usage of materials as well. Manpower losses are identified by oper-

ations and by individuals and by the reasons for down-time and non-productive work. The most dramatic effect of the control costing program has been obtained from the emphasis on machine utilization and machine efficiency. This program is a continuous one and constant refinements are required in order to direct attention to additional sources of cost reduction and profit improvement. It has converted our cost accounting function from one of historical and often critical reporting to that of a partnership with production supervisors in achieving common objectives.

Assisting In Arriving at Product Prices

As stated in the N.A.C.A. Research Series No. 24, *Product Costs for Pricing Purposes,* "Pricing is a profit planning problem in which management searches out the alternatives and compares them one against the other in order to choose the one which promises to be the most advantageous." The study further comments that production costs are the starting point in pricing but that many other factors have to be considered in arriving at pricing decisions. Management accounting can be particularly helpful in the pricing of special business and marginal business. Here the effect on volume and the recognition of incremental costs call for the best accounting evaluation.

The accounting function at Johnson & Johnson goes even further. It also furnishes basic information which is used in pricing new products, recognizing the potential volume, special costs incurred in initial production, and normal costs. Related to decisions on pricing is prompt reporting of the effect of cost increases. When material prices are a major factor in total costs, the accounting effort must be prompt to recognize important price fluctuations and evaluate their effect on gross profit margins. We recognize important cost changes by prompt issuance of "market cost revisions".

Improving the Product Mix

Management accounting contributes to profit improvement by directing attention to the differing profit margins of individual products. A full line of products has to be carried in order to meet competition or to exclude competition from securing a share of the customer's business. In these circumstances, it is important that the sales and merchandising departments be informed of the profit margins of individual put-ups. Their efforts should be guided to emphasize the maximum profit potential consistent with their other objective—customer service. In addition, subnormal gross profit margins of put-ups direct attention to cost reduction requirements or possible sales price adjustments.

Simplifying the Product Line

The necessity for carrying a full line of products often results in an excessive number of put-ups, some of which contribute little to volume or profit. These products generally incur excess costs of production scheduling, purchasing, special production runs and inventory investments, not usually reflected in standard costs. Accounting can serve management by calling attention to the low volume products and thus exert pressure for review and possible elimination from the line. A similar problem arises in the production of special products varying slightly from the regular put-ups but produced to meet customer service demands. Here it is important that procedures be designed to limit the special situations, by requiring specific approvals.

Evaluating Alternative Courses of Action

Management accounting at our company plays an important part in the evaluation of alternatives. Since these alternatives generally involve decisions having a long-term effect on investments and profits, it is important that the financial factors be carefully considered. A surprising number of proposals are constantly under review. Some involve major projects, such as whether to construct a regional production unit or a finished goods warehouse. Here the cost of investment in duplicate production facilities and excess capacity must be matched with the less tangible factors of competition, acceptance of local manufacture and customer service. A more common decision is that of make or buy, involving questions of out-of-pocket costs, overhead absorption, quality control, and product development.

Accounting considerations are also a part of many day-to-day production alternatives. For example, where material cost is the significant cost element, the proposal to increase machine speeds must be matched against the possible increase in material waste. Tandem machine operations may save labor cost at the expense of increased material usage. The evaluation of equipment proposals which include alternatives of size, speed, capacity and location is a common application of management accounting techniques.

Making Maximum Use of Production Facilities

Multiplant operations, involving the use of similar production facilities in several plants, offer an unusual opportunity for management accounting to contribute in an area often considered outside of accounting responsibility. The

increasing cost of high speed, complex machinery has focused our attention on the more effective use of the investment. One of the problems in developing capacity data was the varied output of production expressed in different units and multiple put-ups. This was solved through the use of shifts of production as a common measure of activity. The production forecast for the year is converted into annual shifts of production. The result is related to capacity shifts based upon a three-shift, five-day week. This ratio is developed for each machine or group of common machines. The resulting report has called attention to "tight" production areas in which requests for capital appropriation could be anticipated. The report likewise directed attention to excess capacity.

When comparisions were made with similar data developed for each of our other plants, we had the basis for several important decisions, such as:

1. Transferring equipment from one plant to another to equalize production and eliminate six-day operation or costly third shifts.
2. Combining equipment having low volume and usage in one plant and eliminating the excess equipment carried in the other plants (subject to factors of freight costs, spreading the risk, etc.).
3. Assigning marginal and special business to fill up the partial production shifts at each plant.
4. Focusing attention on areas in which improvement in machine efficiency could pay off—an increase in speed or a reduction in downtime might provide sufficient additional capacity to defer a capital expenditure.
5. Disposing of excess capacity by sale of equipment to affiliates, thus minimizing their need for new investment.

Participating in Cost Reduction Programs

In no area of management accounting does the teamwork approach pay-off as it does in the group participation in cost reduction. Cost reduction planning at Johnson & Johnson consists of continuing programs of profit improvement. These programs are dramatized in the form of annual objectives, expressed in lists of specific projects for each plant and department. Projects consist of plans for reducing waste, increasing machine speed, methods improvements, etc. Reports issued at regular intervals measure progress toward achievement. The savings realized are incorporated in standard costs for the coming year. A new list of projects is developed each year.

Under our concept of accounting, industrial cost accountants are members of the production team. Their knowledge of current performance and their familiarity with the cost possibilities, disclosed by interplant cost comparisons and other cost data, are invaluable in considering projects for cost reduction. The mill cost accountants are constantly evaluating proposals developed by production supervisors and industrial engineers. The control costing program and the other examples of management accounting which have been given provide added background for cost reduction participation.

Setting the Profit Goals

Although the attainment of current budgets, cost standards and other current targets receives the most day-to-day emphasis, an equally important part of the planning function is the long-term planning for profit. Our budget program provides an opportunity for accounting to take part in setting profit goals. One of the techniques used is to develop, by July 1 of each year, a preliminary forecast for the following year. This forecast provides management with an early look at the probable results for the year to follow, with sufficient time available for careful evaluation and revision. This technique has proved to be a valuable aid in achieving management objectives and targets in the final budget.

Management accounting participates in the use of the preliminary forecast by relating the preliminary results to long-term targets which have been set for return on capital and gross and net profit margins. If the prospective results are unsatisfactory when measured against these objectives, the accounting function has an opportunity to suggest possibilities for improvement. These suggestions, and proposal submitted by other departments, are reviewed with the president and the management board. The reviews generally result in departmental commitments to cost savings which yield the profit improvement needed to achieve the long-term profit goals. Thus, the preliminary forecast sets the stage for the studies made by every function of the business, without waiting for the last minute adjustments that might otherwise have to be made.

Opportunities Unlimited

The examples which have been cited and several others which could be added to the list describe how management accounting is used at Johnson & Johnson for the purpose of profit improvement. They suggest the many opportunities that are available to industrial accountants to enlarge their contribution to management. Management is looking to the accounting organization for assistance in developing plans and for guides to management decision.

Analyzing Unit Cost Data for Management

by FORREST L. HEUSER

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Operating results must often be reduced to a unit cost basis in order to prove meaningful for management guidance. Many accountants merely satisfy the requests for such data without providing a base for comparison and without analyzing the data presented. This paper outlines a method for supplying management with the desired information in a manner that will permit its use as the basis for action.

THERE ARE CONSTANT demands from management for unit cost information for evaluation of present production costs versus objective costs employed for price planning, evaluation of the unit cost impact of engineering changes, and evaluation of component parts costs versus purchase costs for the same item. One of the common faults of the cost accountant in complying with requests of this nature is to supply a detailed unit cost developed with a good deal of accuracy and then fail to compare or analyse it. Exhibit 1 illustrates the dilemma facing management when comparative information is not supplied. Submission of these cost figures without explanatory or analytical comparisons with prior cost data would certainly lead to questions such as:

1. Were unit cost estimates for this item submitted in the original presentation?
2. How did the poor profit level escape attention?
3. Was sales price set too low?
4. Was labor inefficient?
5. Is overhead high?
6. Was material overcosted?
7. Were tools exorbitant?
8. Or has the accounting department once again published something that is confusing but will prove all right upon analysis?

Consider how much more effective the data offered management in Exhibit 2 can be. In that example, a clear analysis of the difference between the profit indicated in original estimates, and that actually attained (Exhibit 1) is disclosed. In this form, it becomes evident that engineering design changes and economic increases contribute $5.00 to the net profit variance of $5.75. Other analytical aspects are in turn disclosed and will be discussed more thoroughly in a later section of this article.

Cost Conversion Necessary for Proper Analysis

Direct comparison of the actual cost at standard volume with the comparison base will disclose the variances which must be analyzed in terms of basic cause.

Product A

ACTUAL COST AT STANDARD VOLUME

After 6 Months of Production

Price			**$25.00**
Actual Cost			
Material	$7.00		
Labor	.50		
Variable Overhead	3.60		
Fixed Overhead	2.15	$13.25	
General Expense			
Administrative Expense	2.50		
Product Advertising	2.00		
Tools	7.00		
Other	1.00	12.50	
Total Cost			25.75
Net Profit			$ (.75)
Economic Profit (Price less variable actual costs)			$13.90

EXHIBIT 1

To achieve this end, cost fluctuations, traceable to volume have been removed from the data shown in Exhibits 1 and 2.

The conversion of cost data at actual volume to standard volume levels is major problem in development of comparative unit costs. However, if simple ground rules are established, the actual conversion to standard volume may be accomplished within an accuracy range reasonable for analysis. A usable actual cost at standard volume may be obtained by dividing actual fixed or non-variable costs by standard volume quantity and by adjusting actual volume variable costs to standard volume levels by application of the rates of change reflected in a "step-type" budget of variable expense. After eliminating volume variances by converting actual costs to standard volume the major classifications of variances remaining for analysis are due to engineering design changes, processing changes, economic shifts, efficiency and allocation and mix.

Product "A"

UNIT COST COMPARISON

	Pricing Base	Actual After 6 Mo. Production	(Over) / Under Pricing Base					
			Total	Engineering Design	Processing	Economics	Efficiency	Mix and Allocation
Price	$25.00	$25.00	$	$	$	$	$	$
Cost								
Material	5.00	7.00	(2.00)	(2.00)	.50	(.50)		
Labor	1.00	.50	.50	(.75)	1.25			
Variable Overhead	3.00	3.60	(.60)	(.75)	.15			
Fixed Overhead	2.00	2.15	(.15)		(.15)			
Factory Cost	$11.00	$13.25	$(2.25)	$(3.50)	$1.75	$ (.50)	———	———
General Expense								
Sales & Administration	2.00	2.50	(.50)	(1.00)				(.50)
Product Advertising	1.00	2.00	(1.00)				(1.00)	
Tools	5.00	7.00	(2.00)		(1.00)			
Other	1.00	1.00						
Total General	$ 9.00	$12.50	$(3.50)	$(1.00)	$(1.00)	———	$(1.00)	$(.50)
Total Cost	$20.00	$25.75	$(5.75)	$(4.50)	$ .75	$(.50)	$(1.00)	$(.50)
Net Profit	5.00	(.75)	(5.75)	(4.50)	.75	(.50)	(1.00)	(.50)
Add: Fixed Overhead	2.00	2.15	.15		.15			
General Expense	9.00	12.50	3.50	1.00	1.00	———	1.00	.50
Economic Profit	$16.00	$13.90	$(2.10)	$(3.50)	$ 1.90	$(.50)	$ -	$ -

EXHIBIT 2

Segregating Variance by Source

The cost of engineering design changes should be reviewed in terms of a consistent type of processing. New automation or revisions in basic processing techniques should not be permitted to obscure the true cost of an engineering design change. The evaluation of these changes is of the utmost importance in determining the effectiveness of the design engineering staff. Accordingly, the cost developed should be clear cut and reflect a consistent computation base as follows:

1. Material cost charges will be developed for the quantitative requirement at the economic price level prevailing in the base study. Purchase part cost variances will be analysed by the purchasing department. In the event that economic conditions or other external factors have affected the price negotiation, Purchasing will evaluate its impact on the total negotiation and isolate that portion of price change due primarily to design changes.
2. Labor charges will be evaluated by determining standard hours which will be eliminated or added if the change is incorporated within the processing employed in development of the original comparison base.
3. Where labor charges are incurred in minor design changes, standard variable overhead rates will be applied to develop the total labor overhead cost of the change.
4. Where a major design change takes place without a change in labor, overhead will be analysed in detail to determine if any costs accrue as a result of the change. Thus, some changes may be incorporated in present machine operations by the addition of a special head or fixture. In this instance, labor would not be changed but expense tools, maintenance, etc. may increase.

Processing changes are of more importance with each passing year, because the introduction of automation and special purpose machines requires continued

methods and processing improvements to remain competitive. Accordingly, careful analysis should be prepared disclosing the cost impact of any revised processing. This can be accomplished by comparing the standard costs of the comparison base after equating for design changes with the standard costs generated by the processing presently in effect.

Increases or decreases in cost because of economic changes are readily ascertained by means of a price index covering the material employed and one for the type of non-productive items included in overhead. Price index data should be supplied by the purchasing department. Changes in labor rates will generally be subject to contractual agreement and are, accordingly, readily available.

Efficiency factors can be developed by application of budget variances to the basic unit cost data. Thus, the percentage of variance for direct labor, variable overhead, etc. can be applied directly to the comparable unit cost data in order to develop the specific unit value for budget variance. The budget variance will normally include any deviation in cost due to economics and, therefore, these must be subtracted from the budget variances in order to obtain a true reflection of operational efficiency.

To this point, each of the major variances has been defined in a manner which makes them inter-dependent. However, it may be expected that there will be some residual amounts which are as yet unexplained. Actually, these will accrue as a result of three factors: computation deficiencies, shifts in distribution and allocation of indirect expenses, and the mix of production within the plant. These factors have been grouped as the residual amount under the classification "mix and allocation." Residual amounts of any magnitude, should, of course, be reviewed to verify their nature.

Interpretation is Final Step

Exhibit 2 is an improvement over Exhibit 1 from a reporting standpoint but the variance analysis would be worthless without proper interpretation. Subsidiary schedules may often be desirable to disclose the chief source of variance. For example, engineering design variances might be summarized in the following manner:

Engineering Design
Variance (Over)/Under Pricing Base

	Tools	Material	Labor Overhead	Total
1. Change in basic forging to strengthen product	$ (1.00)	$ (.50)	$	$ (1.50)
2. Additional shielding to stylize product		(.75)	(.50)	(1.25)

3. Chrome plating increased to provide longer wear quality		(.25)	(.50)	(.75)
4. Other		(.50)	(.50)	(1.00)
Total	$(1.00)	$(2.00)	$(1.50)	$(4.50)

The above table discloses that three major engineering design changes contributed the bulk of the cost variance. As those changes would have required prior management approval, this recapitulation will serve to refresh memory on the matter. Similar treatment can be accorded the other variances adjusting the tabular data and comments to the needs of the specific variance. Thus, an efficiency variance in overhead or labor might be analyzed in terms of the contribution from each department. This would then pin responsibility on specific people.

To complete the report, some discussion and, where possible, data should be included to indicate the proposed corrective measures under consideration. In the illustration, prime importance would be given to the possibility of cost recovery through increased price, the potential of reducing the cost through engineering design changes, the possibility of additional processing, and the reduction of advertising expense.

Proper Analysis Is Worth the Effort

The methods of preparing the analysis set forth in Exhibit 2 have been developed on a broad basis because of the constant need to exercise good judgment in attempting an analysis of this type. Many forms of analysis can be designed for this purpose which would permit greater application of routine computation and even a greater degree of positive mathematical tie in. However, the type of analysis presented above requires continuing evaluation whereas formula methods might tend to place too much reliance on routine data. Methods permitting the greatest application of good judgment are recommended.

It should be remembered that, when this method of analysis becomes accepted in any business, it will contribute materially to the control of cost. At first, it may appear over-burdensome in terms of time requirements but, actually, it need not be, if cost personnel use sound judgment in developing their variance analysis and refrain from the very normal desire to furnish detailed support of variances where good estimates may better serve the purpose.

Developing Better By-Product Costs for Pricing

by R. WEAVER SELF

Chief Accountant, Alabama By-Products Corporation, Birmingham, Ala.

The objective of this paper is to encourage companies and their accounting staffs not to by-pass by-products if costs useful for pricing are desired. Favoring by-product costing through combining allocation of pre-"split-off" costs with post-"split-off" costs, the author exemplifies this and other applications of by-product costing practices to the situation of a coal carbonization operation.

THE SUBJECT OF BY-PRODUCT costing has not been explored and developed through accounting publications to the same degree as have most other subjects dealing with manufacturing costs. The purpose of this paper is to present the various methods of accounting for the production of by-products, especially as related to pricing policy, and, as an illustration, a case study of one method which was determined to be most accurate and acceptable for a coal carbonization operation. We will first describe the problem, give some specific background, and then deal with a hypothetical situation. Although the production of by-products resulting from the processing of coal to coke underlies this paper, many other industries producing by-products could use the same basis for the allocation of costs prior to the "split-off" point to assure proper by-product costing.

By-products may be classified into two groups according to their marketable condition at the point of initial appearance:

1. Those which can be sold in their original form without further processing, and
2. Those requiring further processing after separation from main product.

A few of the many typical examples of both type of by-products are as follows:

1. Cottonseed, which was formerly thrown away or used only as fertilizer, has become the basic raw material for the oil and oil cake industry.
2. Bagasse from the grinding of sugar cane, formerly a waste product, is now used to make wallboard.
3. Molasses, left as a residium in the making of sugar, is now the raw material for industrial alcohol.
4. The production of butter and cheese is accompanied by the production of buttermilk in the dairy industry.
5. In the flour milling industry, low-grade flour, mill feed and bran are produced, together with the main product, high-grade flour.
6. As the result of mixing and boiling ingredients in the manufacture of soap, sundry rejections take place, some of which, such as glycerine, are collected as by-products.
7. The manufacture of coke by modern methods produces such residuals as sulphate of ammonia, coal tar, benzol, gas and many other chemicals.

The Pricing Problem Makes By-Product Costing Important

The costs, manufacturing and administrative, represented in the selling price of an article consist of variable expenses which increase and decrease directly with the number of units made or sold and fixed expenses which remain constant regardless of volume of production or sales. The sales price of any manufactured article must, as a minimum, equal the sum of the variable costs or it is more profitable not to make the product. But the recovery of variable costs only is a poor substitute for truly profitable prices. The total manufacturing, selling and administrative cost is the lowest aggregate price at which the whole production can be indefinitely sold. Even this means just breaking even, which is not satisfactory as a permanent thing. Therefore, the full cost of manufacturing, shipping and selling, plus a fair profit, is the usual basis for pricing competitive goods. Generally, over a long period of time, this method of pricing will closely approximate the market price of the goods as established by competitive forces.

If full costs are so important to profitable pricing it is very important that the total cost of each article manufactured for sale be determined as accurately as possible. Normally, no serious problems are encountered in job order costing or in process costing, where only one product is involved. In costing by-products, the allocation of cost occurring prior to the "split-off" point requires careful study. The costs incurred after the "split-off" do not present this problem.

In the coke and coal chemical industry, management is realizing more and more the important part by-products play in the profit structure. Management must know how profitable each product is. In order to develop this information, it becomes necessary to know the cost of each product and by-product. The accountant must determine some reasonably accurate method of allocating cost to each product prior to the "split-off" point or management will not be supplied with needed information. At present the more generally used methods of accounting for by-products on the profit and loss statement are:

1. Net sales of by-products treated as "other income".
2. Revenue from sales of by-products included in total sales.
3. Revenue from sale of by-products deducted from total costs.
4. Net yield from by-products disclosed as a deduction from total costs.
5. Allocation of joint costs to all products based on per cent recovery from raw material consumed.

How We Changed By-Product Costing; Consumption Records Used

The last-named method, as presented in detail in this paper, has been successfully used by a steel producing corporation which had previously been charging

all by-product and benzol expenses to the cost of producing coke. The sale value of these coke by-products was then credited to the cost of producing coke. This practice understated coke cost and also resulted in understating costs of all steel products manufactured in subsequent operations. The coke by-products inventory items were assigned arbitrary values, based on the selling price. This procedure was far from satisfactory as to regular products and also resulted in the sale of by-products without the cost of their production being known.

In order to overcome these problems, the chairman of the coke plant operating committee and the manager of the cost accounting department undertook to determine the proportionate value of the recovery from coal used to make the by-products. To this value was added their known processing costs. These two items were totalled for the respective by-product costs. By use of this revised cost accounting procedure, the by-product sales division was more accurately guided for the first time in its sales activity by the profits and losses realized from each by-product. Also coke and pig iron costs were more accurately stated. In addition, true inventory values of by-products were obtained and accounting procedures became simpler and more definite.

The flow chart in Exhibit 1 displays how raw material goes to ovens and where the derivatives appear. The coke ovens are the "split-off" point and the cost of each product is the pro rata portion of joint cost plus subsequent cost, as the revised method recognizes.

Coal is the major cost of producing coke. Therefore, in coal carbonization, an accurate record of coal receipts and consumption must be kept. Such a record supplies operating department management with information as to type

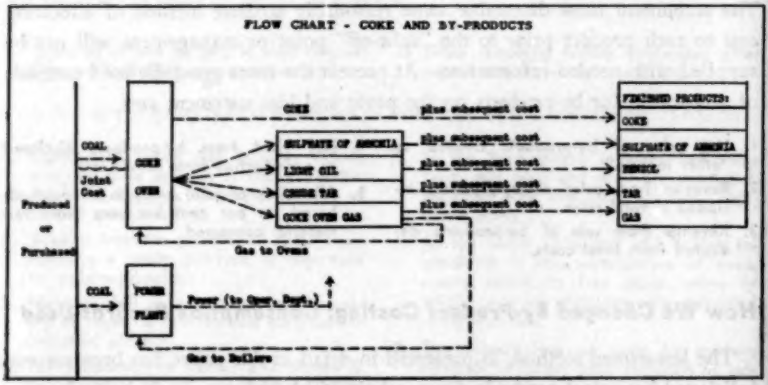


EXHIBIT 1

of coal, supplier, date shipped, date received, weight and disposition. If coal is stocked, a classified record by stockpile should be kept and coal consumed should be determined by weightometer weights. Understated coal consumption will result in understated costs and overstated yields, with resulting inventory discrepancies as well as incorrect costs.

The daily coke production weights are estimated, based on anticipated yield from the coal charged, with actual production computed at end of month. The yield of coke depends on several factors, for example, type of coal consumed, coking time, volatile content of coal, carbon content and moisture. This information is usually furnished by the laboratory for use by the accounting department in determining the correct yield. Daily coke production is controlled by current observation of the coke inventory and daily shipments. If there seems to be a discrepancy, the yield is adjusted to reflect as nearly as possible the actual production.

Monthly coke production for cost accounting purposes in based on the difference in inventory plus coke shipments. This coke production is compared with the calculated production based on the yield formula in relation to coal consumed. For example, the yield percentage may be 75 per cent. Therefore, if the coal consumed is 100,000 tons, the coke production should be 75,000 tons. If there is a substantial difference in the actual as compared with the anticipated production, the manager of the cost accounting department and the chairman of the coke plant operating committee check to determine the variance. Monthly production of by-products and benzol are determined by usual inventory methods.

Case Data Applied to Available Costing Methods

By applying the various methods of accounting for by-products to a hypothetical case, we can study the results and determine which method reflects the most accurate product cost, inventory value, and profit. For this study. the coke production capacity selected is approximately midway between that of a commercial producer of coke or pig iron and that of a captive steel plant, inasmuch as both types of operations are in the coal chemicals (by-products) industry and it is considered that such a plant should try to earn at least five per cent after taxes on net sales. Let us assume, therefore, that a corporation has a plant which has an annual coke production capacity of 2,750,000 tons. The corporation owns several mines and also buys coal on the open market to blend with its own. In addition to coke, it produces benzol, toluol, xylol, crude solvent, crude naphthalene, gas, tar, sulphate of ammonia and pyridine.

BASIC DATA FOR A MONTH ON PRODUCTION AND SALES

Coal Consumed: 270,000 tons

	Units Produced	Units Sold
Products:		
Coke	201,000 Tons	204,000 Tons
Pure Benzol	303,000 Gals.	270,000 Gals.
Toluol	84,000 Gals.	55,000 Gals.
Xylol	39,000 Gals.	45,000 Gals.
Pure Still Residue	54,000 Gals.	35,000 Gals.
Crude Solvent	30,000 Gals.	24,000 Gals.
Crude Naphthalene	66 Tons	123 Tons
Gas	3,100,000 MCF	1,170,000 MCF
Gas Used at Ovens	-	1,630,000 MCF
Gas Used at Boilers	-	300,000 MCF
Tar	1,828,500 Gals.	1,650,000 Gals.
Sulphate of Ammonia	3,500 Tons	3,000 Tons
Pyridine	3,000 Gals.	2,000 Gals.

EXHIBIT 2

All inventories are valued at total cost, excluding selling, general and administrative expenses.

The operating data for the month of January, 1956 are shown in Exhibit 2. This information is applied in Exhibit 3 to by-product costing Method No. 1 in the list given above, in which sales of by-products appear as "other income" in the profit and loss statement. This method should be used only where the values of the by-products are relatively unimportant, where the use of a more detailed method would entail accounting costs disproportionate to the benefits derived, or where no clearly defined basis exists for separating the cost of by-products from the main product. No value is assigned to by-product inventories, which here results in coke inventory being overstated because, under this method, all costs are charged to the main product. This fact causes a loss on the sale of the main product (coke) and the entire gain is reflected in the sale of by-products. To break even on the sale of coke, on this basis it would be necessary to sell the coke for $26.13 per ton. Further, the absence of adequate by-product inventory controls under this method may lead to losses from fraud or mismanagement.

The second method is the subject of Exhibit 4. Under it, by-product sales are totalled with main product sales. This is a variation of the first method. The only difference is in presentation. The sales of by-products are added to

METHOD NO. 1: NET SALES OF BY-PRODUCTS TREATED AS "OTHER INCOME"

Monthly Profit and Loss Statement

Sales - Coke (204,000 @ $25.00)		$5,100,000
Cost of Sales:		
Beginning Inventory (80,000 @ $23.00)	$1,840,000	
Produced (201,000 @ $26.26)	5,277,846	
Available (281,000 @ $25.33)	7,117,846	
Ending Inventory (77,000 @ $23.20)	1,786,400	
Cost of Sales		5,331,446
Operating Income		(231,446)
Other Income:		
By-Product Sales		
Benzol (270,000 @ $.35)	$ 94,500	
Toluol (55,000 @ $.35)	19,250	
Xylol (45,000 @ $.35)	15,750	
Pure Still Residue (35,000 @ $.09)	3,150	
Crude Solvent (24,000 @ $.20)	4,800	
Crude Naphthalene (123 @ $50)	6,150	
Gas (1,170,000 @ $.22)	257,400	
Tar (1,650,000 @ $.13)	214,500	
Sulphate (3,000 @ $44)	132,000	
Pyridine (2,000 @ $1.10)	2,200	749,700
Income Before Taxes		$ 518,254

EXHIBIT 3

METHOD NO. 2: REVENUE FROM SALES OF BY-PRODUCTS INCLUDED IN TOTAL SALES

Monthly Profit and Loss Statement

Sales:			
Coke (204,000 @ $25.00)		$5,100,000	
By-Products:			
Benzol (270,000 @ $.35)	$ 94,500		
Toluol (55,000 @ $.35)	19,250		
Xylol (45,000 @ $.35)	15,750		
Pure Still Residue (35,000 @ $.09)	3,150		
Crude Solvent (24,000 @ $.20)	4,800		
Crude Naphthalene (123 @ $50)	6,150		
Gas (1,170,000 @ $.22)	257,400		
Tar (1,650,000 @ $.13)	214,500		
Sulphate (3,000 @ $44)	132,000		
Pyridine (2,000 @ $1.10)	2,200	749,700	
Total Sales			$5,849,700
Cost of Sales:			
Beginning Inventory (80,000 @ $23.00)		$1,840,000	
Produced (201,000 @ $26.26)		5,277,846	
Available (281,000 @ $25.33)		7,117,846	
Ending Inventory (77,000 @ $23.20)		1,786,400	
Cost of Sales			5,331,446
Income Before Taxes			$ 518,254

EXHIBIT 4

METHOD NO. 3: REVENUE FROM SALE OF BY-PRODUCTS DEDUCTED FROM TOTAL COSTS

Monthly Profit and Loss Statement

Sales - Coke (204,000 @ $25.00)			$5,100,000
Cost of Sales:			
Beginning Inventory (80,000 @ $21.50)		$1,720,000	
Produced (201,000 @ $26.26)	$5,277,846		
Less: By-Product Sales:			
Benzol (270,000 @ $.35)	94,500		
Toluol (55,000 @ $.35)	19,250		
Xylol (45,000 @ $.35)	15,750		
Pure Still Residue (35,000 @ $.09)	3,150		
Crude Solvent (24,000 @ $.20)	4,800		
Crude Naphthalene (123 @ $50)	6,150		
Gas (1,170,000 @ $.22)	257,400		
Tar (1,650,000 @ $.13)	214,500		
Sulphate (3,000 @ $44)	132,000		
Pyridine (2,000 @ $1.10)	2,200		
Total By-Product Sales	749,700		
Net Cost (201,000 @ $22.53)		4,528,146	
Available Cost (281,000 @ $22.24)		6,248,146	
Less Inventory (77,000 @ $19.47)		1,499,190	
Cost of Sales			4,748,956
Income Before Taxes			$ 351,044

EXHIBIT 5

coke sales and all costs are deducted from total revenue to derive net income, which is the same as under the first method. Note that the income from Method No. 3, exemplified in Exhibit 5, is different from the prior illustrations, inasmuch as by-product sales treated as cost deductions, cause a lower total cost of production. Therefore, there is a different basis for inventory value of coke. This method has a tendency to understate the cost of coke. Also, it creates an unstable cost from month to month, because of the varying quantities of by-products sold. The understatement of coke cost could cause the sales department to establish a sales price below actual cost and, if a steel producing plant is involved, all products manufactured in subsequent processes would be understated. We come now to the fourth method (Exhibit 6). Net yield from by-products is a deduction from cost. After the point of "split-off" (coke oven) when the individual products emerge and are identified, costs incurred to make them marketable are charged to each. This is an improvement over prior methods, because by-products are charged with apportioned expenses and production costs subsequent to the "split-off" point. However, the inventory of by-products is based only on subsequent cost, excluding selling, general and administrative expenses. Under this method, the production cost of coke is reduced by net yield from by-products. A step toward product costing is accomplished through this method. However, until the cost incurred prior to the

METHOD NO. 4: NET YIELD FROM BY-PRODUCTS DISCLOSED AS A DEDUCTION FROM TOTAL COSTS

Monthly Profit and Loss Statement

Sales - Coke (204,000 @ $25.00)			$5,100,000
Cost of Sales:			
Beginning Inventory (80,000 @ $20.75)		$1,660,000	
Production			
Joint Cost (Charged to Main Product)	$3,636,887		
Subsequent Cost-Main Product	1,468,719		
Total Cost (201,000 @ $25.40)	5,105,526		
Less: Net Yield from By-Products (See below)	585,260		
Net Production Cost (201,000 @ $22.49)		4,520,266	
Available Cost (281,000 @ $21.99)		6,180,266	
Less: Coke Inventory (77,000 @ $19.86)		1,529,220	
Cost of Coke			4,651,046
Income Before Taxes			$ 448,954
Net Yield from By-Products:			
By-Product Sales			$ 749,700
Beginning Inventory		$ 12,120	
Subsequent Cost		172,320	
Available Cost		184,440	
Less: Ending Inventory		20,000	164,440
Net Yield From By-Products			$ 585,260

EXHIBIT 6

"split-off" point has been allocated to the respective products, we have not accomplished our goal of proper product evaluation.

The Preferable Method

In the next method—the fifth and last on our list and exemplified in Exhibit 7—all products take their proportionate share of expenses, including cost incurred prior to the "split-off" point. This method has been used satisfactorily by several industrial plants producing coke for sale or for use in their blast furnaces. The distribution of coal value to the respective products under this method is accomplished by a cooperative study made by operating, chemical, and accounting management.

Through their combined efforts, joint costs are allocated to the respective products based on proportionate value of the recovery of each product from coal charged into ovens. The recovery value of the coal consumed varies with the yield of coke and breeze (coke dust) recovered but, if a 75 per cent yield of coke and breeze is assumed, the credit to coke costs for coal value used to make the by-products would be 25 per cent minus the per cent loss due to moisture. Therefore, the proportionate charge to by-products would fluctuate with the coke yield. As the coal value in total cost of by-product and benzol products ranges from 7 per cent in ammonium sulphate to as much as 80 per

METHOD NO. 5: ALLOCATION OF JOINT COSTS TO ALL PRODUCTS BASED ON PER CENT RECOVERY FROM RAW MATERIAL CONSUMED

Monthly Profit and Loss Statement

Sales - Coke (204,000 @ $25.00)		$5,100,000
Cost of Sales:		
Beginning Inventory (80,000 @ $19.90)	$1,592,000	
Produced (201,000 @ $22.58)	4,537,812	
Available Cost (281,000 @ $21.81)	6,129,812	
Less Inventory (77,000 @ $19.95)	1,536,150	
Cost of Sales		4,593,662
Income from Coke		506,338
Income from By-Products (See below)		86,296
Total Income before Taxes		$ 592,634

Monthly Profit & Loss Statement of By-Products and Benzol

	Benzol*		Sulphate		Pyridine		Total*
	Units Gallons	Amount	Units Tons	Amount	Units Gallons	Amount	Amount
Sales	270,000	$94,500	3,000	$132,000	2,000	$2,200	$749,700
Cost of Sales:							
Beginning Inventory			50	1,900	100	80	13,490
Produced	303,000	99,884	3,500	140,562	3,000	2,892	717,714
Available	303,000	99,884	3,550	142,462	3,100	2,972	731,204
Ending Inventory	33,000	9,900	550	20,900	1,100	880	67,800
Cost of Sales	270,000	89,984	3,000	121,562	2,000	2,092	663,404
Profit from Operations		$ 4,516		$ 10,438		$ 108	$ 86,296

*The total includes figures for other by-products not detailed

EXHIBIT 7

cent in tar and coke oven gas, it is understandable why this item of cost must be accurately recognized. The first table in Exhibit 8 shows the distribution of coal value to the various by-products on the basis of 75 per cent coke and breeze yield. The second table gives the allocation to all products of the total coal carbonized.

All operating and maintenance costs are charged to the departments, as worked. The proratable costs included in conversion cost are apportioned as follows: (1) cost prior to "split-off" point based on Table 2 of Exhibit 8 (2) power, steam, water and fuel based on units consumed, (3) general plant expense, administrative expense, vacation, pension and welfare fund, payroll taxes and workmen's compensation based on plant's direct labor, (4) general taxes and depreciation based on capital dollars invested for the respective departments,

DISTRIBUTION OF COAL VALUE FOR THE MONTH

(Used in Connection with Method No. 5)

Table 1

	% of Total Coal Carbonized	Lbs. Per Ton Coal Carbonized	Tons Coal Credited to Coke Cost	By-Product Charged
Loss (Moisture)	4.25	85	None	
Sulphate of Ammonia	.30	6	810	Ammonium
Light Oil	1.50	30	4,050	Benzol Produced
Crude Tar	4.50	90	12,150	Tar
Coke Oven Gas	14.45	289	39,025	Coke Oven Gas
	25.00	500	56,025	

Table 2

	% of Total Coal Carbonized	Lbs. Per Ton Coal Carbonized	Total Coal Consumed	Department Charged
Coke	79.25	1,585	213,975	Coke Ovens
Sulphate of Ammonia	.30	6	810	By-Prod. Dept.
Light Oil	1.50	30	4,050	Benzol Dept.
Crude Tar	4.50	90	12,150	By-Prod. Dept.
Coke Oven Gas	14.45	289	39,015	By-Prod. Dept.
	100.00	2,000	270,000	

EXHIBIT 8

and (5) selling expense based on direct salesman's salaries chargeable to each department.

Inasmuch as only one product is produced in the coke department, all conversion cost chargeable to this department is applied to coke but, in the by-products and benzol departments, this type of cost must be prorated to the several products produced. The proration to gas, tar, ammonimum sulphate, and pyridine is based on a comprehensive study made by the engineering, operating, accounting and laboratory management to determine how much cost is involved in extracting each product from gas and refining it into a marketable product. Light oil is recovered from coke oven gas by absorption with a high boiling oil. The principal refining operations are distilling to separate the light oil into fractions with the desired ranges and washings with concentrated sulfuric acid for removal of impurities. The boiling points of these principal products, namely, benzol, toluol and xylol, rise progressively by tem-

perature intervals of approximately 30°C. Since these products are refined at different stages, the operating and engineering management can furnish the cost department with the per cent of conversion cost for each product.

The cost of the light oil is computed and this cost is prorated to washed benzol, crude solvent and crude naphthalene based on per cent recovery of each product from light oil. The cost of washed benzol is prorated to the finished products based on units used to produce them. This cost procedure as detailed above will result in a product cost for each product. Careful analysis and study of the proration of cost under this method renders results as accurate as any cost method in which allocated expenses are involved. The Profit and Loss Statement given as Exhibit 7 shows the end results. The coke cost does not reflect any undue credit from by-products and the income reflects true profit from each product and the correct valuation of all inventories.

Significant information is developed. The cost sheets of the coke ovens, by-products, and benzol departments, are issued monthly to top management and to district and departmental supervisors. The cost sheets compare the actual cost with the budget and reflect the variance. They exhibit the cost of each product and pinpoint any specific cost which is in excess of or below the budget. The department supervisors use the cost sheet extensively in their cost discussions, as the comparison of the actual cost with the budget points out emphatically the areas of potential cost reduction. Further, cost-minded supervisors are usually the result of cost-minded executives. The reports provide the coke plant manager with the necessary information for the monthly cost meeting of the departmental supervisors. In short, of the five methods generally used in accounting for by-products, this is the only method which furnishes management with the necessary cost control data.

The Method Matters

As shown in the various illustrations contained in this paper the proper costing and pricing of by-products can have a material effect on the profit structure and the assets of a company. Accordingly, it is vital that all companies producing by-products give careful attention to proper allocation of joint cost to assure the accurate development of product costs and the determination of sound sales prices. Successful management must be provided with a sound allocation of cost to both principal product and all by-products. It must know the basis for these costs in order to establish a competitive market price and one which will return a reasonable profit on investments. This is another important area for accounting service.

Organizing for Disposition of Surplus Materials

by HAROLD O. SMITH

Supervisor-Salvage and Reclamation, Tennessee Coal & Iron Division, United States Steel Corp., Birmingham, Alabama

Business management has long recognized that there comes a time when certain types of assets cease to be assets. When this happens, management is faced with the problem of disposing of such equipment or material in the manner most advantageous to the company through further use, sale, or scrapping. Items normally available for disposition include material recovered in repairs, left over from construction, property retirements, and obsolete or discontinued equipment and parts. This paper outlines the disposition procedures followed in one division of a large company and sets forth the benefits obtained from the program.

FOR MANY YEARS it was believed that we had an adequate system of disposing of surplus materials. Approximately forty years ago a salvage and reclamation division was established and assigned the responsibility of disposing of all surplus and obsolete equipment and materials. The principal materials handled by this new organization were items of retired properties and, to a limited extent, surplus and obsolete stores materials. Quarterly reports of retired properties were furnished by the engineering department and the various storekeepers provided reports of slowmoving and obsolete items carried in stores inventory. It was the responsibility of the salvage and reclamation division to contact all maintenance supervisors throughout the company to determine whether or not the equipment or materials should be retained for further use. When no further use for the equipment or material could be found it was offered for sale to outside parties. However an analysis of results obtained through this program revealed the following three major procedural deficiencies:

1. Complete reporting of surplus and obsolete stores materials was not being made to the salvage and reclamation division.
2. The quarterly and annual reports submitted to the division were not satisfactory in that sales were delayed or lost altogether because these reports were not being prepared on a current basis.
3. Purchase orders were not being routed through the division for application of available surplus materials.

During the past ten years, procedures have been reviewed periodically and improvements made to assure maximum benefits from the program. Almost every department in the Tennessee Coal and Iron Division contributed to these improvements. Our management realized the need and issued instructions for

full cooperation by all concerned. The following is a brief resume of the responsibilities of the various departments in assuring the success of the present salvage and reclamation program:

1. The plant salvage committee, composed of top plant management personnel, is responsible for making a semi-annual tour of each plant to assure complete reporting of available surplus and obsolete equipment or materials.
2. Plant operating management, in collaboration with the plant accounting department, determines when a piece of equipment has ceased to be economically useful.
3. The engineering department advises with operating management on retirement of equipment and consults with the accounting department on possible application of available equipment or materials to contemplated appropriations. These departments also furnish statistical data and advice to the purchasing department as to the current value of used equipment offered for sale.
4. The comptroller's department has custody of all surplus and obsolete equipment and materials and is directly responsible for its maximum application to purchase order requests.
5. The purchasing department is responsible for disposing of surplus and obsolete equipment and materials to other operating divisions of the corporation, returning new materials to vendors and, finally, for the sale of buildings, equipment and materials which are of no further use.

Equipment and material become available for disposition through the salvage program from various sources. Against the background already given, the procedures developed for reporting, controlling and disposing of surplus material are outlined in the following sections of the present paper.

Disposition of Retired Property Items

When decision has been made to replace a facility, a Request for Authority to Retire Property (Exhibit 1), is prepared by the chief engineer under whose jurisdiction the property is located. The chief engineer indicates on the form the condition of the material or equipment, that is, poor, fair, good, very good or new, for subsequent use by the plant accountant in reporting the facility for disposition through transfer or sale. Prior to submitting the retirement request for approval, the chief engineer forwards it to the plant accountant involved, who inserts the approximate value of spare parts and/or supplies which will be of no further use after the equipment is out of service. The plant storekeeper creates a record of these surplus items, so that they may be made available for disposition along with the equipment. After approval by responsible members of plant management, a copy of the retirement request is forwarded to the purchasing department.

Upon receipt of the approved request and after decision has been reached regarding recommended disposition, the plant accountant prepares a four-part form reporting the item for disposition. This set is composed of three copies of a surplus material card and one copy of a card entitled Surplus Equipment,

C-730-R

REQUEST FOR AUTHORITY TO RETIRE PROPERTY

AT MINE NO. 1 WORKS

May 26 19 55

Mr. A. C. Williams Vice President

Authority is hereby requested for the dismantling and/or disposal of the following facilities or equipment:

Mining Machines

Facility Numbers: See attached list

Approximate Date Equipment Will Go Out of Service: May, 1955

Reason for Retirement: Replaced by equipment purchased on Appropriation Number 7384

Proposed Disposition: To be sold or scrapped

Recommended: _____ Manager of Mfg. Operations / Raw Materials

Recommended: _____ Chief Engineer

Recommended: _____ Vice-President - Engineering

Recommended: _____ Superintendent

FINANCIAL INFORMATION:

Original Cost—Equipment Retired	$ X	
Less—Accrued Depreciation	$ X	
Net Depreciated Cost—Equipment Retired	$ X	
Estimated Salvage—Equipment Retired	$ X	
Estimated Dismantling Cost—Equipment Retired	$ X	
Estimated Gain or Loss (Loss in Red)—Equipment Retired		$ X
Value of Spare Parts and/or Supplies on Hand which Will be of No Further Use	$ X	
Estimated Salvage—Spare Parts and/or Supplies, etc.	$ X	
Estimated Gain or Loss (Loss in Red)—Spare Parts, etc.		$ X
Total Estimated Gain or Loss (Loss in Red)		$ X

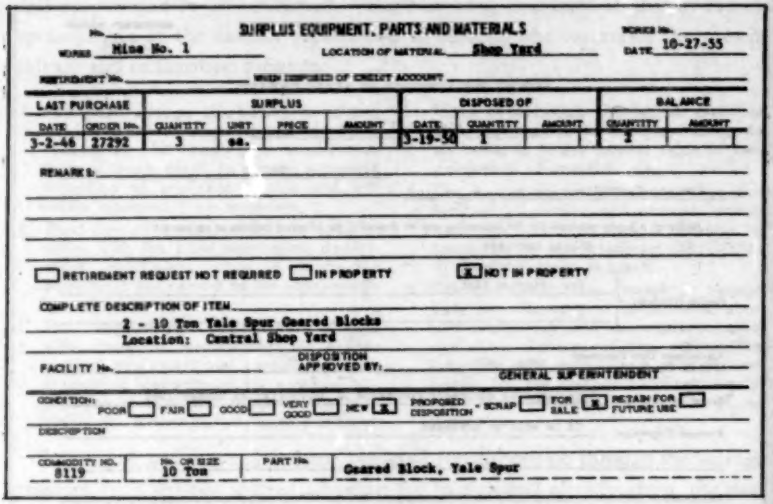
Approved _____ Controller

Approved _____ Vice-President

Authorized _____ President

EXHIBIT 1

Parts and Material (Exhibit 2). Both of these forms are prepared, simultaneously, for each item and are placed in a visible file for ready reference. Due to the nature and volume of material involved, reporting is sometimes made on lists rather than individual cards. This is particularly true in reporting large amounts of surplus equipment parts. The basic data appear in the same place



SURPLUS EQUIPMENT, PARTS AND MATERIALS

No. _____ WORKS Mine No. 1 LOCATION OF MATERIAL Shop Yard WORKS No. _____ DATE 10-27-55

REQUISITION No. _____ WHEN DISPOSED OF CREDIT ACCOUNT _____

LAST PURCHASE		SURPLUS				DISPOSED OF			BALANCE	
DATE	ORDER No.	QUANTITY	UNIT	PRICE	AMOUNT	DATE	QUANTITY	AMOUNT	QUANTITY	AMOUNT
3-2-46	27292	3	ea.			3-19-50	1		2	

REMARKS: _____

☐ RETIREMENT REQUEST NOT REQUIRED ☐ IN PROPERTY ☒ NOT IN PROPERTY

COMPLETE DESCRIPTION OF ITEM

2 - 10 Ton Yale Spur Geared Blocks
Location: Central Shop Yard

FACILITY No. _____ DISPOSITION APPROVED BY: _____ GENERAL SUPERINTENDENT

CONDITION: POOR ☐ FAIR ☐ GOOD ☐ VERY GOOD ☐ NEW ☒ PROPOSED DISPOSITION - SCRAP ☐ FOR SALE ☒ RETAIN FOR FUTURE USE ☐

DESCRIPTION

COMMODITY NO.	No. OR SIZE	PART No.	
8119	10 Ton		Geared Block, Yale Spur

EXHIBIT 2

on both forms. There is some difference in other data. The surplus material card was designed primarily for the disposition of surplus items within the company. The surplus equipment, parts and material form was designed to facilitate sale of surplus and obsolete items to outside parties. It is retained by the plant storekeeper until decision has been made to sell, at which time it is released to the purchasing department. It is a point that both forms are designed to show the condition of the item considered surplus. This information is very important because the conditions of an item affects the disposition and, if offered for sale, affects the sales price. (The proposed disposition section is executed by the plant salvage committee at the time of the semi-annual survey described later. However, the recommendation is a tentative one.)

If the plant storekeeper feels that the item can be disposed of within the originating plant, he retains the entire set of forms for a reasonable length of time. If he does not anticipate use of item, the original form is forwarded to the central stores control section of the accounting department. (If an item for sale is located underground or in some other location not convenient for examination by the prospective buyer, the form is retained at the works until the surplus equipment is made available for inspection.) It is the responsibility of the central stores control section to make maximum application of available surplus and obsolete equipment and materials to current purchase

orders and to arrange for transfers of equipment and materials between plants.

A large yellow weather resistant "for sale" card is prepared, showing essentially the same data as the surplus equipment parts and material card. These yellow cards, attached to the surplus material or equipment, are especially helpful when customers are taken to the works to inspect items for sale. In many cases, a customer will see and purchase items so identified, which were not under consideration when he came to make his inspection and many sales previously lost are now made. A plant number is assigned to each item for sale and is shown on both the surplus equipment parts and material card and the for sale card. Reference is made to this number in subsequent transactions, for positive identification.

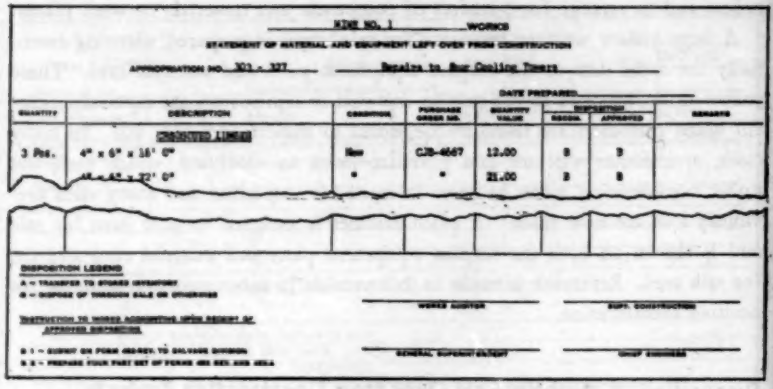
Disposition of Material Left Over from Construction Projects

If, during the period of construction, it is determined that certain materials or equipment are surplus, a listing is made on a Statement of Material and Equipment Left Over from Construction (Exhibit 3). The statement is prepared as far in advance of the closing of the appropriation as possible in order to effect maximum disposition of surplus items. Upon completion of all work contemplated, physical inventories of materials are made by the plant storekeeping department and checked against the perpetual inventory records maintained for materials purchased under the particular appropriation. After discrepancies are reconciled, items not included on previous lists are reported.

These statements provide, among other things, recommendations for the disposition of items shown. They also provide space for the approval of such recommendations by responsible managerial personnel. The recommendations and approvals are secured by members of the plant accounting organization in collaboration with the engineering and operating departments. Recommendations for the disposition of surplus materials and equipment left over from construction are processed in the following manner:

1. The plant storekeeper reviews and marks items appearing on the statement which he recommends for transfer to stores inventory.
2. The plant storekeeper, in collaboration with the engineering and operating department representatives, reviews and marks items recommended for disposition through transfer or sale.

The plants are not allowed to retain material left over from construction for their own use unless it can be applied to an open appropriation or is to be carried in stores inventory. After recommendations and approvals are secured, eight copies of the statement exemplified by Exhibit 3 are forwarded, first, to the property bureau of the accounting department and then to the central stores



KINE NO. 1 WORKS

STATEMENT OF MATERIAL AND EQUIPMENT LEFT OVER FROM CONSTRUCTION

APPROPRIATION NO. 301 - 327 Repairs to Bar Cooling Towers

DATE PREPARED

QUANTITY	DESCRIPTION	CONDITION	PURCHASE ORDER NO.	QUANTITY VALUE	DISPOSITION: RECOM.	DISPOSITION: APPROVED	REMARKS
	CREOSOTED LUMBER						
3 Pcs.	4" x 6" x 16' 0"	New	CJB-4567	12.00	B	B	
	4" x 6" x 22' 0"	"	"	21.00	B	B	

DISPOSITION LEGEND

A = TRANSFER TO STORES INVENTORY

B = DISPOSE OF THROUGH SALE OR OTHERWISE

INSTRUCTION TO STORES ACCOUNTING UPON RECEIPT OF APPROVED DISPOSITION

B 1 = SURVEY ON FORM AS REQ'D TO SALVAGE DIVISION

B 2 = PREPARE FOUR PART SET OF FORMS AS REC. AND SELL

STORES AUDITOR — SUPT. CONSTRUCTION

GENERAL SUPERINTENDENT — CHIEF ENGINEER

EXHIBIT 3

control section. The latter reviews all items recommended for transfer or sale for possible transfer to stores inventories at other plants. The recommendations for disposition are then subject to final review by the engineering department. Its recommendations are forwarded to the comptroller for final approval of disposition. After approval, the statements are distributed to interested management personnel.

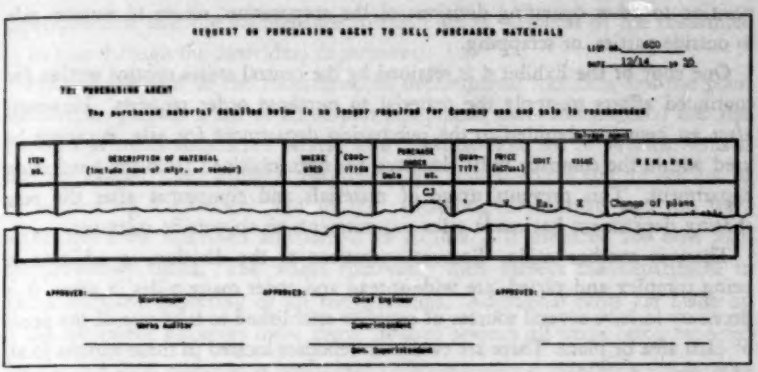
This approved statement is also the plant storekeeper's authority to effect transfers to stores inventory of all applicable items and to prepare the form already shown as Exhibit 2 for all items to be retained by the company but not transferred to stores inventory (other plants are privileged and encouraged to draw on these stocks) and items which have been recommended for disposal in the sequence listed below:

1. Transfer to other operating divisions of the corporation.
2. Return to vendor.
3. Sale to outside parties.
4. Scrap.

A list is prepared for the purchasing department of items considered acceptable by other operating divisions or the vendor. The items not falling in this category are offered for sale by transmission of the surplus equipment, parts and material card to the purchasing department, or are recommended for scrapping.

Disposition of Surplus Stores Material

Often stores materials become surplus due to changes in operations and



REQUEST ON PURCHASING AGENT TO SELL PURCHASED MATERIALS

Loc no. 600
Date 12/14 19 20

To: PURCHASING AGENT

The purchased material detailed below is no longer required for Company use and sale is recommended

Item no.	Description of material (include name of mfgr. or vendor)	Where used	Condition	Purchase order Date	Purchase order No.	Quantity	Price (actual)	Unit	Value	Remarks
					CJ			Ea.		Change of plans

Approved: _____ Storekeeper
Approved: _____ Chief Engineer
Approved: _____
Works Auditor
Superintendent
Gen. Superintendent

EXHIBIT 4

obsolescence of retired properties. These are immediately reported for disposition. If, after a reasonable time, it is determined that the surplus material cannot be used within the company, steps are taken to effect disposition. A Request on Purchasing Agent to Sell Purchased Material (Exhibit 4) is prepared by the plant storekeeper and forwarded to the purchasing department showing description of the item, original vendor, where used, condition, purchase order number and date, quantity, actual price, unit and value. A separate form is prepared covering material purchased from each vendor. Prior to submission to the purchasing department, the form is approved by responsible members of plant management. This has two specific benefits. First, management has an opportunity to review the items listed to prevent disposition of material of value to the plant. Second, the material listed for disposition is indicative of ordering practices and, therefore, has a restraining effect on those authorized to place purchase orders.

Only five copies of this form are prepared. However, to serve all needs, sufficient copies of a statement showing quantity and complete description of each item available for disposition are attached. All copies of this detailed listing are forwarded to the central stores control section where copies are distributed to all other plant storehouses. Each storekeeper reviews the forms and indicates any item or items which can be used at his plant. Between-plant transfers at full inventory value are then prepared to cover such items. The engineering department also receives copies of listings of surplus stores items for possible application to impending construction projects. After the plants have laid claim to items they can use, detailed descriptions of material available for further disposition are then forwarded to the purchasing department for dis-

position to other operating divisions of the corporation, return to vendor, sale to outside parties, or scrapping.

One copy of the Exhibit 4 is retained by the central stores control section for continued efforts to apply the material to purchase order requests. However, after an item is submitted to the purchasing department for sale, it cannot be used within the company until clearance has been obtained from the purchasing department. This prevents usage of materials and equipment after the purchasing department has made sales commitments to an outside customer.

There is another angle. Because operations of the division, in addition to being complex and varied, are wide-spread and cover many miles in areas, it is necessary to have several sources of supplies established to take care of the needs of each area or plant. There are twelve storehouses located in these various localities. This offers materials disposition opportunities. Each plant storekeeper knows that it may be possible to obtain certain types of supplies from other storehouses. Therefore, one storehouse often requisitions material from another when the quantity needed is not sufficient to warrant the placing of a purchase order request. The items may or may not happen to be surplus. In addition to minimizing the number of purchase orders, two other advantages are obtained through this procedure, viz., avoiding the penalty for small quantity purchasing and consuming material which may well be surplus at another storehouse within the company.

Work of the Plant Salvage Committee

A system of semi-annual inspection tours, has been instituted. These are of a "cleanup" nature for, as the procedures just narrated suggest, materials and equipment becoming surplus are immediately reported for disposition. This helps to utilize surplus material or equipment in lieu of purchasing such items, obtain cash for material and equipment of no further use, prevent further deterioration of items and reduction in value, and to promote good housekeeping within the plants. However, the tours strengthen the whole procedure. It is in the instincts of an operating man to retain as much surplus material as possible for future use. Recognizing this, management established a plant salvage committee composed of the general operating superintendent as chairman, the chief plant accounting officer, the superintendent of maintenance, and a representative of the engineering department. This committee makes semi-annual inspection tours of each plant to assure complete reporting of surplus or obsolete equipment, parts, and material found in each department. The departmental

superintendent and the maintenance foreman act as members of the committee in its tour through the individual departments.

Prior to the visit of the committee, its departmental members and the plant storekeeper, prepare a list of all surplus equipment, parts and material and also a record of items considered merely slow moving. The list of surplus items is checked against those already reported to the central stores control section of the accounting department and to the purchasing department and the form which has been described and shown as Exhibit 2 is prepared for each item not previously listed. The whole committee then surveys the department to assure complete reporting of all surplus items. Additional cards are made up if the committee discovers more items. It then reviews all items being reported for the first time and makes final plant recommendations regarding disposition.

Pricing of Transfers and of Items for Sale

Material transferred between storerooms is charged and credited at standard prices. Equipment is transferred on the basis of undepreciated value. Establishment of sales prices is based on several factors, the most important of which are:

1. Condition of an item is a vital factor in determining the best possible sales price. Although it is the responsibility of plant management to report the condition of an item, it is often necessary for a representative of the purchasing department to inspect it, determine when it was last overhauled, and review its operating history with qualified operating personnel.
2. Current market conditions largely govern the sales price. Very often equipment in excellent condition is offered for sale. Some of it may even be new. However, upon investigation it may be found that one of several situations exist which will make it difficult to dispose of the item. The market may be flooded with the particular type of equipment or the item may have been especially designed for a specific operation and not generally suitable for use in other types of business.
3. Standard prices have been more or less established for certain types of equipment. These standards are used as the starting point for pricing. The condition of an item governs departures from the standard, either up or down. This is true especially in sales of certain types of equipment, such as used motors.
4. Current prices and acquisition cost have an influencing effect on establishing the sales prices. These are used in negotiations with customers.
5. Scrap value of surplus items is also considered when establishing sales prices.

Generally, bids are requested for most items offered for sale. The value of the item offered governs, to some extent, the possible deviation from this policy. For example, bids are requested for abandoned buildings, with the sale being made to the highest bidder. On the other hand, if only a few squares of used roofing or scrap wood is involved, it is inspected and a price set for disposal on the basis of "first come, first served". Inventory of spare parts for equip-

ment being sold is offered to the purchaser at a very reasonable price because scrapping may be the alternative.

"Sales" by the Purchasing Department

As previously stated, in the event that the central stores control section and the plant storekeeper fail to dispose of surplus material or equipment, it is reported to the purchasing department. Even at this point, we still look for uses within the company. The purchasing department therefore forwards several copies of the lists of surplus materials to other operating divisions, provided the quantity and value of the materials involved are sufficient to warrant a transfer if the items prove to be needed. For example, several mine loaders were retired and offered for sale after replacement by a more satisfactory and larger loader. New spare parts in stock were valued at approximately $20,000. It was found that one of the other operating divisions had twenty similar machines. To date, surplus parts valued at approximately $10,000 have been shipped for use in connection with these machines.

At the same time that material and spare equipment parts are offered to other operating divisions, the purchasing department contacts the vendor from whom the material was originally purchased, to determine whether or not it can be returned for credit. The success attained in returning this material to vendors depends on several factors. Among these are original contract with the vendor, length of time material is retained before requesting permission to return, condition of material when offered for return, price increases since original purchase of material, and the vendor's inventory position at the time the request is made. The greatest problem is the natural inclination to retain materials and spare parts too long. As a consequence, it is found that they are of little or no value to the vendor because of poor condition or obsolescence. Efforts are constantly being made to correct this condition and indications are that some progress is being made.

When the purchasing department has been unsuccessful in its efforts to transfer surplus equipment, materials or spare parts to other operating divisions or to return them to vendors, action is initiated to effect outside sale. There are several outlets. First, a few local businesses have somewhat similar operations to ours. Normally, these concerns are the best prospective customers. Second, there are local dealers who find small operators in need of equipment of the type offered for sale. Usually, when all other efforts have failed, surplus or obsolete equipment can be sold to these dealers at well above scrap price. Also, many valuable contacts have been made with similar dealers in other sections of

the country. When equipment is available for sale in which they might be interested, a listing is forwarded to them. Contacts are initiated with the purchasing department by these dealers when they have calls for equipment which they think may be available from our division. These contacts are made by telephone, wire or correspondence, depending upon urgency. Another source of possible sales is found through industry periodicals. Potential customers are selected from these publications and listings of available material for sale are forwarded to them.

When an agreement is reached as to price, the customer forwards check, or cash, as practically all sales of this nature are cash transactions and the material and equipment is sold on an "as and where is" basis. A "contract" letter is written to the customer (except on small sales) outlining the terms of the agreement and instruction as to the procurement of the material. A safety clause is included in these letters to protect the company in case of accident to the customer's representatives while in the plants. The purchasing department then prepares an order to cover the sale. Copies of the order are forwarded to all interested personnel as authority to release material and make necessary accounting entries.

A Procedure Which May Suggest Adaptations

In recent years our management, has realized the potential revenue to be derived from an active program of surplus items disposition and greater emphasis has been placed on reporting and disposing of all items of no further use to the division. This emphasis on reporting and disposition has been accomplished by intensifying the program through reassignment of responsibility to management personnel and by correcting the deficiencies existing in the prior reporting and disposition procedures. It is obvious from the explanations included here that our program has grown from a "hip pocket" record keeping system into an important activity, contributing significantly to the welfare of the division. Perhaps the history of this activity in our company and the general outline of procedures now being followed in reporting, controlling, protecting and disposing of surplus and obsolete materials will be helpful to others faced with similar problems.

Time-Based Distribution of Selling and General Costs

by ROGER S. MAKEPEACE

Economist, Scovill Manufacturing Company, Waterbury, Connecticut

The selling and administrative cost distribution procedure here described extends far beyond generalized allocations on such bases as sales or production cost and involves a standard time distribution in terms of percentages for each employee, excluding only top management. Budget estimates are collected by the same mechanism through which the percentages are originated and, at least annually, revised. These budget estimates are thus more nearly tailormade than is true of general industrial accounting practice in these particular expense areas.

THE SOLUTIONS FOUND to such problems as are dealt with in this article are apt to be compromises between the ideal in principle and the ideal in ease of application. For example, in the case of distribution of selling costs by product lines, an analysis each month of call reports for each salesman might be the theoretically correct basis for determining the cost allocation. On the other hand, the easiest basis might be a simple distribution in proportion to sales volume by lines. In some cases the latter might be satisfactory, i.e., if it could be reasonably well established that selling cost per unit of sales (whether in dollar or physical units) was the same in each line, or even if suitable weighting factors could be developed (such as saying that Line A cost twice as much to sell, per unit of sales, as Line B), so that distribution could be on a basis of weighted units. In other cases the first method, basing distribution on call reports, might conceivably be feasible, or might become so, through electronic data processing methods. This might be the ultimate in recording what happened in terms of costs incurred for particular products in each period, but it is doubtful that it would mean much in terms of cost per unit sold, because the costs of one period do not necessarily relate to the sales of that period. Three calls on one customer in one month may produce no business. One call the next month may result in an order. The order may be for delivery six months hence.

Under the varying circumstances outlined above, it seems that some type of compromise based on estimates of selling effort by product lines, effective over a fairly long period, might produce useable statements for administrative purposes without unreasonably extensive accounting effort. I believe the methods we have worked out at the Scovill Manufacturing Company for use in our

Waterbury Divisions exemplify such a solution, and I present them on these pages, in somewhat simplified form, in the hope that this may be helpful to some of our members who are struggling with this problem. I will review first the basis used for allocating branch office expense to product lines, and will follow this with a discussion of the use of similar procedures for the distribution of the costs of administrative departments, indicating the types of departments in which we use such methods. I will also review the relationship between the establishment of cost distribution standards and the establishment of budgets for the administrative control of the expense of each sales office and each administrative department.

A Standard Time Distribution for Each Employee

The heart of the Scovill method is the predetermination for each manager, salesman, stenographer, clerk, warehouseman, or other sales department employee (and similarly for each employee of each administrative department as discussed at greater length below) of a standard percentage distribution of time per product line served. For example, suppose Mr. Black sells brass mill products, aluminum mill products, forgings screw machine products, and miscellaneous stampings. He would be asked in November to estimate for the coming year how his time will be spent and he would then furnish a breakdown which might be as follows:

Brass mill products	30%	Screw machine products	20%
Aluminum mill products	10%	Cosmetic containers	10%
Forgings	10%	Miscellaneous stampings	20%
			100%

Mr. Brown, in the same office, may sell nothing but forgings and screw machine products, devoting half his time to each. Miss Smith, their secretary, would evidently have still a different distribution representing a composite of both salesmen's distributions.

When percentage time distribution estimates have been received (on suitable forms furnished for the purpose) from each office, covering each employee, they are reviewed by the sales managers responsible for each product line to determine whether the branch office organization for the coming year, as revealed by these statements, is acceptable and in line with any plans they may have. When cleared by the sales department, these time distribution estimates become the basis for distributing the budgeted costs of each office, in a

DISTRIBUTION OF BUDGETED MONTHLY EXPENSE - BRANCH OFFICE #10
Extension of Time % by Personal Cost as Illustrated for Brass Mill Products

Employee Name	Budgeted Salary**	Salesman's Expense	Budgeted Cost	Time and Cost Distribution by Product Line*									
				Brass Mill Products		Screw Mach. Products		Contract Stampings		Buttons, Fasteners, Zippers	
Green, Mgr.	$1200	$ 400	$1600	20%	$320	20%		25%		10%	
Black	900	300	1200	30	360	20		20			
Brown	800	200	1000			50					
White	800	300	1100			10				90	
Miss Smith	300		300	15	45	35		10			
Miss Jones	250		250	10	25	10		10		60	
Personal Cost	4250	1200	5450		$750		$1300		$665		$1300
Percent of Personal Cost			100%	13.8%		23.8%		12.2%		23.8%	
These percentages used to distribute:											
Rent, Heat and Light (May be distributed by floor space studies if available)			300		41		71		37		71
Telephone, Telstype, Telegraph (May be distributed by toll calls, extensions, messages, etc.)			500		69		119		61		119
Supplies, Maintenance, Misc. Services			200		27		47		25		47
			$6450		$887		$1537		$786		$1537
Percent of Total Cost (May be used to distribute actual cost)			100%	13.8%		23.8%		12.2%		23.8%	

Note: If special studies are used to distribute rent or telephone, the percentages of total cost will obviously be different from the percentages of personal cost.

*Several columns omitted. If included, percentages at bottom of page would add to 100%, and dollars to $6450.

**Including Payroll Surcharge, i.e., provision for social security, insurance, and other fringe benefits.

EXHIBIT 1

manner similar to that shown by the following simplified calculations. Establishment of the budgeted amounts to be distributed will be described later, as will the distribution of actual costs of each office or department. Exhibit 1 illustrates the distribution of these percentages.

It should be fairly evident from these calculations that the procedure is as follows:

1. Enter expected monthly salary of each employee.
2. Enter expected travel and entertainment expenses, based on review of previous years for this individual and for other individuals in similar positions.
3. Enter time distribution percentages.
4. Extend percentages by total cost of each individual by product line. The full calculation is shown for brass mill products in this example but, in practice, the dollar total by product line is obtained by cumulative multiplication which saves considerable time and effort, especially in large offices which may run to 50 or more employees.
5. Calculate percentage each product line is to total personal cost.
6. Enter budgeted rent, heat and light and distribute by these percentages, or by a study of floor area assigned to salesman and clerks for each product line if available.
7. Enter budgeted communication expense and distribute similarly, or in accordance with a study of toll costs, extensions, teletype messages, and telegrams chargeable to each product line, if available.
8. Enter budgeted miscellaneous operating costs and distribute similarly.
9. Total each product line and determine percentage of product line cost to total cost. This will differ from Item 5 above if special studies are used to allocate rent or telephone expense.

Budget Proposals Fit In

There have been several references above to budgeted expense. The establishment of budgets and the determination of expense distribution standards go hand in hand. Budget information is obtained at the same time and from the same people as time distribution estimates, so that we may be sure both sets of information are in conformity, and that, together, they represent the organization and how it is intended to be employed. The procedure may be outlined as follows:

1. At the same time that time distributions are called for, as described above, a set of budget forms is supplied to the manager of each sales office or administrative department. These forms show the average monthly expense for the previous calendar year and for the current year to date, analyzed according to principal accounts, somewhat as follows:

	Actual monthly expense		Suggested budget
	1955 Total	1956 To date	For 1957
Payroll	$4000	$4200	
Travel etc.	1000	1150	
Telephone etc.	450	550	
Supplies	100	110	
Maintenance	50	40	
Services	30	40	
Local Taxes	—	20	
Rent, Heat & Light	250	300	
Total	$5880	$6410	

2. The manager is requested to do as follows:
   a. List all personnel shown on his time distribution form, on reverse side of budget form, making sure that the lists agree and that care has been taken to provide for additions (or reductions) of personnel planned for the coming year.
   b. List the proposed salaries, total, and enter the result on line 1 of 1957 column. This may not be as convenient for branch offices as for administrative departments and may better be done at the home office.
   c. Review the travel and entertainment expenses of the individuals listed, determine recommended budgeted amounts for each, total and enter on Line 2.
   d. Review the communications expense of the office and enter the recommended budget on Line 3.
   e. Review and budget miscellaneous operating expenses, including rent.
   f. Forward the completed proposal to the budget coordinator for summarization and presentation to the general manager for review and establishment of final budgets.

The Branch Office Sales and Expense Report (Exhibit 2) illustrates how the budget may be set up for a branch office, using the fictitious Branch Office No. 10 discussed in this article. The same report form may also be used for reporting actual results monthly and cumulatively and, by entering sales and dividing

BRANCH OFFICE SALES & EXPENSE REPORT

OFFICE

PERIOD

MONTHLY BUDGET

Copies to: From: Gen. Accounting

No. Salesman	Sales Month	Sales To Date	Trav. Exp.
Green			400
Black			300
Brown			200
White			300
			1200

	Expense	Current Month	Year to Date
S- 1	Salaries & Wages	4000	
S- 2	Hourly Payroll		
S- 3	Payroll Surcharge	250	
S- 4	Commissions		
S- 5	Travel Expense	1200	
S- 8	Cartage from Warehouse		
S- 9	Adv. not in Adv. Budget		
S-11	Supplies Incl. Postage	100	
S-13	Telephone-Telegraph-Telatype	500	
S-17	Maintenance & Repair		
S-18	Other Services	50	
S-19	Conn. Sales & Use Tax		
S-20	Unallocated Transportation		
S-21	Samples & Development		
S-31	Taxes	50	
S-34	Rent Incl. Light & Heat	300	
	TOTAL COST	6450	
LESS RENT & SERVICES			
	Charges to Waterville		
	Charges to Oakville		
	Charges to Hamilton Beach		
	Charges to Schrader		
	NET BRANCH OFFICE EXPENSE	6450	

TOTAL

Sales Division	Budget Month Sales	Expense	% of Total	% of Sales	Year to Date Sales	Expense	%
Contract Mfg.		786	12.2				
Merchandise		-------					
D. &C. Container		180	2.8				
Forging & Token		1268	19.6				
Screw Mach. Prod.		1537	23.8				
Button & Fastener		1000	15.5				
Slide Fastener-Zipper		537	8.3				
Mill - Brass		887	13.8				
Mill - Aluminum		255	4.0				
GRAND TOTAL		6450	100.0				

EXHIBIT 2

them into sales division expense, may include a ratio of expense to sales. The section "rent and services" provides for situations where personnel of other divisions of the company have space in Waterbury division branch offices. In these cases, a monthly charge for rent, share of supplies, administration, etc., is calculated and is charged to the outside division at a flat monthly rate. The resulting net branch office expense is selling expense of the Waterbury sales divisions, as shown in the lower section. Figures on this sample form are taken from Exhibit 1.

Administrative Expense Allocation — And Departments

Although the above description of procedures has been based primarily on branch sales offices, there is very little difference in the handling of administrative department budgets and expense distributions. The procedure is basically the same throughout, although the relationships of the various types of expense are quite different from the branch office illustration. For example, travel is a minor item and telephone expense is handled through one department and does not enter into the calculations of the other administrative departments. Rent as such does not exist and the corresponding items of buildings and system depreciation, maintenance, heat, janitorial services and watchmen are distributed directly to product lines based on areas occupied, without passing through administrative department accounts. On the other hand, various types of services (association dues, credit services, payroll preparation and armored car delivery, employee relations and training services, rental of telephone equipment, etc., etc.) may bulk quite large in some departments. Sometimes these can logically be distributed in the same manner as the payroll of the department, sometimes some other method must be employed. It is also possible, in some cases, to use an indicator of effort expended as an aid in arriving at time distribution. Examples are number of invoices by product line for billing and accounts receivable, number of time tickets for part of the payroll office and number of clock cards or payroll records for another section of that office. However, all these variations are just that—variations in a basic system, which may be used as aids in attaining the same result, namely, a budget of expenses for each selling or administrative department, allocated according to a standard distribution representing the effort and expense which has been planned for each major product line.

The scope of the problem in our case may be judged by the fact that the Waterbury divisions operate approximately twenty branch offices and ten warehouses, from Boston to Los Angeles, while the selling and administrative departments at Waterbury number approximately sixty. The administrative departments cover a wide variety of activities, falling generally into the following groups:

Divisional Administrative Departments

Works managers' offices —Mill, stampings, rod fabricating and closure (button, fastener and zipper) divisions.

Production managers' offices—Each product line.

Estimating, tool engineering, drafting, process engineers, manufacturing process control laboratories, product design and development departments, stores record department.

General Administrative Departments

(These serve all Waterbury Divisions but exclude headquarters group consisting of the—president, several vice-presidents, treasurer, secretary, general counsel, comptroller, etc., whose services are considered a general company expense.)

Accounting	—General accounting, billing, accounts receivable, accounts payable, credit, factory accounting, cost department, payroll, transcribing, mailing and filing.
Employment	—Employee relations, employment, hospital, safety, training.
Purchasing & stores	—Purchasing department, general stores office, general stores.
Engineering	—Methods engineering, plant engineering, maintenance engineering, metals research laboratory.
Traffic	—Traffic office, shipping and receiving departments.
Communications	—Telephone department.

Many of these are very large and very complex departments, the work of which is not very easy to assign by product lines. However, reasonably satisfactory methods have been developed over a period of years, sometimes involving allocation by such a measure as labor and overhead for a three year period but more often keyed to some more direct measure of the department activities, for assigning the cost of each individual employee in these departments. This extensive listing of departments has not been given here for the purpose of showing the difficulties of this application but rather to point out how the procedure illustrated by the fictitious six-person branch sales office can be extended to cover numerous large and complex departments as a means of establishing budgeted expenditures, both by department and by product line—factually supported by calculations readily referred to and constituting a record of the planned organization and its intended distribution of effort. It may be of interest that, in this instance, the amount of time required of the budget coordinator to accumulate, calculate, and summarize this information is about two full months and that it has been found feasible to do it on an annual basis, with a partial revision semi-annually to cover departments with substantial organizational changes.

Strengths and Weaknesses

References has been made to the distribution of actual expense. This is a matter of choice. Actual expense may be distributed monthly to product lines, department by department, using the percentages of budgeted cost derived as at the bottom of Exhibit 1 or it may be preferable to charge divisional profit

statements with the budgeted amount as a fixed expense and to accumulate the variances for distribution at the year-end.

It can readily be demonstrated that variances which occur because of expenditures for a particular product line will not be charged to the proper line unless the standard is promptly revised to reflect the changed condition, and this is often impractical. For example, suppose an additional mill products salesman is assigned to Branch Office No. 10. The additional cost, including travel, telephone, clerical and supply costs, will be a variance to this office as a whole and, if distributed without revising the percentage standards, will be reflected in costs of all lines, manufacturing as well as mill. Or suppose Branch Office No. 10 decides to take Mr. Brown off forging and screw machine product sales entirely and make him completely a mill man. Until this change is recorded and the standards are revised at the end of the year or possibly at mid-year, the mill will be getting Mr. Brown's services free, at the expense of the lines Mr. Brown was expected to serve. This will be so regardless of whether actual total expense of the office is distributed monthly or whether variance is allowed to accumulate, because the shift has not created any variance so far as the total office is concerned and, as the standards have not been changed, it makes no difference on this point whether the standard or the actual (standard plus variance) cost is distributed.

This rather extreme but perfectly possible example illustrates perhaps the principal weakness of a predetermined cost allocation basis which remains effective for a considerable period. On the other hand, if the work assignments in the units covered are essentially and predominantly stable, the advantages for purposes of planning, evaluating, reviewing and administrating are considerable and will justify the effort required to build up such a system and to re-establish, at least annually, the approved organization and corresponding departmental budgets and product line cost standards. Whether to leave the standards intact for the coming year or to revise them semi-annually, quarterly or even monthly is a matter of balance between effort and results. Each user of a plan of this sort will have different problems and may make different choices in this regard.

In our experience, this approach to costing of what are sometimes called commercial expenses yields a realistic distribution of selling and administrative costs, relatively free of general allocations by such measures as sales volume or direct labor which do not necessarily reflect the actual utilization of the time of selling or administrative personnel. In addition, it provides a body of information of great value in the proper use of manpower and exerting control in a fixed expense area of costs, a characteristic of selling and administrative expenses.

Applying Time Standards to Maintenance Costs

by GEORGE R. ROACHE

Chief General Accountant, General Aniline & Film Corp., Linden, New Jersey

Whether or not standards can be applied to maintenance work is beside the point in this study, which describes their application. This description is preceded by a summary of time study procedure in general and is followed by exemplification of performance reports developed as a result of comparison of actual and standard times for the carrying out of maintenance jobs. On these reports, efficiency percentages are both tabulated and charted.

ONE CAN LIMIT OVERALL maintenance costs through budgets by allocating a certain amount of money for maintenance costs for the plant engineer to spend within a certain period. A comparison of actual expenditures with this budget will then show management how close it came to this goal. The problem here is that we may keep hidden poor performance by workers, poor methods, or other inefficiencies. This type of budget will tell us the total which may be spent, but, without work standards, we have no basis of determining whether or not we are getting a fair day's work for maintenance labor dollars spent. This problem can be solved by the use of the principles of standard cost, i.e., by setting maintenance job labor standards and analyzing variances from them.

At our plants, the industrial engineering departments are responsible for this program. Our management engaged a firm of management consultants experienced in maintenance control through standards to install the system in the dyestuff and chemical division. The consultant had made studies of basic maintenance jobs in many plants and had set time standards for them. It was then up to our industrial engineering department to analyze our own maintenance opreations, adopt the standards where applicable, or set up new ones peculiar to the industry or the plant.

Setting Time Standards—In General

A description of the method involved in setting time standards should, perhaps, be preceded by definitions, to furnish a common basis for discussion:

Work Measurement—Measures work actually done in terms of engineered standards. It is "the direct standard approach".

Standard—A reasonable interpretation of a fair day's work. The time required for an average, experienced, capable, and qualified person to perform an element of work at

a normal speed and efficiency while taking a required amount of rest.

Elements of Work—Separate operations or conditions which are part of the job to be done.

Direct Work Elements—All elements of work which can be evaluated by physical evidence in the completed job or sometime during the work.

Transportation Element—All elements of work related to the movement of man between his work center and the job. This includes both horizontal movement through zones and vertical movements through flights and floors.

Indirect Work Elements—All elements of work which cannot be evaluated by physical evidence but can be deduced from the characteristics of the job, such as planning, measuring, consulting, etc.

Abnormal Work Elements—Elements of work performed under abnormal working conditions such as bad footing, height, extreme cold or heat, dangerous conditions. These are normal work elements multiplied by a factor to allow for abnormal conditions.

Standards are set up as follows: Each one of the general elements—direct, transportation, indirect, or abnormal can be further broken down into more finite divisions. However, if this is done, there is a chance of being drowned in a maze of detail with little added benefit. It is left to the knowledge and discretion of the industrial engineer to determine the nature and detail of the work elements to be recognized. It must be fine enough but not too fine. The value of work elements lies in the fact that most of them are common to many jobs. The time a man has to go from his work center to the job site can be reduced to the time it takes to go through certain zones or areas or the number of flights he must climb to reach any job. Similarly, it takes a certain amount of time for planning any job. Also, a man may be required to do similar work for several jobs. Once a value is fixed as the standard time of a work element, this value can be applied to any job under study where the element appears.

To obtain the standards for work elements, the actual job being done must be studied by the industrial engineer. He observes and writes down work elements in sequence, noting the description of the element, his estimate of the type of performance being done (running from superior to very bad), what he thinks the best requirements would be for the type of work being done, and the conditions under which the man is working. He is looking for the "normal" time in which the job could be done, that is, the time required for the element if the man had worked with normal speed and effectiveness. He takes the time from his stop watch for each element. A factor has been assigned to the estimated rate of performance and he multiplies the time of performance of the element by this factor to secure normal time. This procedure has the effect of increasing

the observed time if the man has been above normal and reducing it if the man has been below normal in rate of accomplishment. For example, if the watch reading had been 400 and the man had performed above average so that the factor would be 1.30, the normal time would be .0520 hours. In other words, a normal man would have taken a time of .0520 hours on the watch where the above average man took .0400 hours.

Standard time is normal time multiplied by a rest factor which includes time for personal needs or other allowances. In other words, we allow in our calculations that a man must have a certain amount of rest and cannot work continuously with maximum efficiency. Even the Army recognizes this truth with the call "take ten" that veterans will recall. Rest factors are based on the minutes of rest required per hour of work required. Certain jobs are more difficult than others because of physical exertions or nervous strain required. We would certainly allow more rest to man loading 100 pound sacks of material than a man sweeping a floor. This rest requirement would also be reduced to a factor and the normal time multiplied by it to secure the standard time. The effect of the multiplication of this factor would be to add to the normal time the amount of the estimated rest required per hour of exertion. If my normal time were .0520 hours and my rest requirements were 15 minutes per hour, I would multiply by a factor of 1.33, and my standard time for the element would be .0693 hours. Therefore, the clocked time, multiplied first by the factor of performance rating and then by the rest factor, will give the standard time of the element.

Setting Time Standards for Maintenance

All maintenance work can be broken down into job elements. For example, if a section of pipe had to be replaced, the job could be broken down into the following operations:

1. Foreman gives instructions to maintenance man on location of break in pipe and general description.
2. Man picks up necessary tools and leaves work center for site of break.
3. On arrival at site, maintenance man consults with production foreman and makes the necessary shut-down of equipment and lines.
4. The pipe is cut to remove defective section.
5. The pipe is rethreaded and the new section installed and tested.
6. The maintenance man cleans up, takes his tools back to the work center, and makes report.

Before standards were fixed many maintenance jobs were studied while in process, and many time study observation sheets were made out. During this time the various elements were grouped into coded classes of direct work elements, transportation elements, indirect work elements, and controllable and

uncontrollable factors to account for delays. We studied each trade separately and this is still the line of progress. For example, jobs assigned to pipefitters were placed under study. An industrial engineer was present at the job to time the elements and identify them with the men involved for each job. He made up a study sheet of his observations and, through the process which has been described, determined the standard time for work elements. The values of the work elements were taken from the job studies and posted to a schedule so that several observed standard times were posted for each work element. For example, values were set down for the time to cut pipe with a hand hack saw. This was a work element. The various values were plotted on a graph based on the pipe size in inches. From the plotting of these points, a curve was approximated. This curve was so formed that every point on it would give a close approximated value of a standard time for hand sawing various sizes of pipe. From these data, a table was made up of the time standards by pipe size (sizes were set up as "up to ⅜, ½ to ¾, 1 to 1¼, etc."). A description was framed for the element as a composite average of related elements of the same general nature. The finer elements making up the general work element were listed such as "position piece in vise, measure and clamp, saw, remove pipe from vise, etc." In addition, the standard time varied with each measurement of size based on the gauge of the pipe. Thus, there grew a file of standard value of elements of work which could be applied to several jobs. Once the values of the elements had been determined, the data became more or less permanent in nature and needed only occasional studies to be kept up to date. This data had then to be applied and interpreted correctly and intelligently to control maintenance labor costs.

We have been discussing the type of element called a direct work element. Transportation is a second principal type. For transportation elements each plant is divided into zones. In the same manner as direct elements, the standard time values for traveling through these zones is calculated from the clocked time. For example, it may take a man a clocked time of 240 (thousands of an hour) on the stop watch to go through three zones on one job. Factored for performance and rest required, the time as standard may become .0264 hours. On another job the time taken to go through two zones may be 180. Factored it may be .0183 hours. On another job, it may take 223 on the stop watch for three zones, or .0253 hours as adjusted. The standard times are taken from several studied jobs and averaged to get a standard time per zone. In the above example, the average standard would be .00875 per zone, or .0088 hours. In the same manner the standard for flights or levels in vertical elements can be determined. We also have to know how many zones and levels are involved in

a direct trip to secure the standard time for the trip. To find the trip factor, the total standard time taken to travel to and from the work place to the job is divided by the standard time for one trip, to determine the standard number of trips necessary. There is a relationship between the type of job and the number of trips necessary. The same studies have also determined the amount of standard indirect work necessary for each type of job.

Applying Standards to Maintenance Jobs

We have discussed the first step, the establishment of standards. Now we must go to the second step, the application of those standards to jobs. The application of standards and the measurement of efficiency is also the responsibility of the industrial engineering department. This is done through standards applicators, who are personnel from the engineering department and who, as a rule, have been selected from maintenance personnel and craftsmen. They have been given instruction in time study principles and have assisted in the development of time standards. The experience they have in working in crafts in maintenance, together with the industrial engineering principles they have been taught, furnish them with the knowledge necessary to apply standards to maintenance jobs.

How is the application of standards made, i.e., how are standards arrived at for a particular job? For certain routine jobs the standards are set for the job as a whole, since the character or the elements of the job remain the same. However, because maintenance work is quite variable in nature, most jobs have to be measured in progress and the total time constructed, that is, a man must go to the job site, put down the elements as they occur, and evaluate it on the job. There is no way of judging work content in many cases until the work is begun. For example, in a machine breakdown a man will not know which parts have to be replaced until he tears the machine down. There are other methods, as applying standards in advance for jobs as we do for our routine jobs. Ours is only one of the methods that can be used.

The second step in the control of maintenance costs through engineered standards takes form at this point. The standards applicator visits the job as often as necessary to observe job content or work elements. He has been furnished with a list of standards covering the work elements which he will encounter in his job analysis. He has a form titled "maintenance job analysis sheet" on which he lists the trade, job number, location code, date, and job description. He then lists all the direct work elements observed in the job, the number of times they occur, and the standard hours for the elements. He is then able to

compute the standard hours of direct work needed on the job. He also knows the number of zones and levels the man has had to travel. He multiplies these numbers by their standard times and then by the standard number of trips necessary, to get the standard time for the transportation elements. He also applies the standard time allocated for indirect work, to allow for planning, and the allowance for abnormal working conditions if present. By adding these elements, he will establish the time standard for the job. On the back of the sheet he will note down any events or conditions he has noticed affecting the work and not accounted for in the standard. Such an item might be idle time over 15 minutes, to show reasons for low performance.

Cost Reports by Man, Group, and Skill

Our practice is to assign job numbers to all maintenance work. By tabulating machines we accumulate costs by job number and reports are issued on the total labor, material, and overhead expended. These costs are the actual costs of the job. As the source of the labor charge, we have a daily job time ticket on which the maintenance worker shows the hours in the day he has worked on each job, the building, and apparatus on which he has worked. The standards clerk verifies these job cards against the clock cards punched by the employee. He then takes the job cards to the standards applicator who, using the information on them, posts the actual time for each job on the job analysis sheet on which he has computed the time standard. It is a relatively simple matter, by dividing the standard hours by the actual hours, to calculate the performance percentage for the men on each job. In addition, he can calculate fairly closely the standard hours by man, by spreading the standard hours on the basis of the actual hours each man worked on the job. These daily actual and standard hours for each man are entered on an individual weekly summary sheet. Although these sheets cannot give an exact record of efficiency, they can serve as an indication to the man's supervisors when actual performance is out of line. In addition, the weekly summaries of each man's performance are consolidated under first line supervisory units so that the foreman can see the relative efficiency of his group.

Weekly cost reports are made by trade (skill). These reports show the number of employees in each trade in the maintenance staff and the total hours they have worked in the week. Since efficiency is computed only on finished jobs measured, hours of unfinished jobs are subtracted and carried forward to the next week. Also subtracted from total hours worked are lost hours covering training classes, meetings, union business, etc. The result reflects the total hours actually worked on jobs completed during the week. After subtracting the non-

GAF
LINDEN PLANT

WEEKLY COST CONTROL REPORT
CONSTRUCTION, REPAIR, & MAINTENANCE

WEEK ENDING 10-31-55

REFERENCE TRADE	NUMBER OF EMPLOYEES	TOTAL HOURS WORKED	% COVERAGE	% PERFORMANCES REFERENCE	AVERAGE PREVIOUS YEAR	AVERAGE YEAR TO DATE	CURRENT WEEK
Painters	20	1725	95	65	70	75	70
Pipefitters	65	2575	70	50	65	70	72
Central	(20)	725	55	45	55	60	55
Area	(45)	1850	75	55	70	75	73
Field Mech.	50	1920	60	50	60	65	68
Central	(15)	575	55	40	50	55	59
Area	(35)	1345	70	55	60	65	69
Welders	15	555	75	50	—	65	63
Elect.	30	1175	60	55	—	60	62
Central	(20)	775	70	45	—	50	53
Area	(10)	400	55	60	—	65	66
Carpenters	15	990	60	65	—	65	70
Note: All figures on this example are arbitrary and have no relation to actual conditions at the plant.							
Section #1	15	575	75	60	65	70	72
Section #2	15	580	80	65	70	75	74
Section #3	20	760	85	70	75	75	76
Section #4	15	560	70	55	65	70	73
Section #5	20	745	90	55	60	65	70
Section #6	10	390	80	50	70	75	73
Section #7	15	560	65	70	75	78	77
CRM TOTALS			75	50	63	70	72

SAMPLE

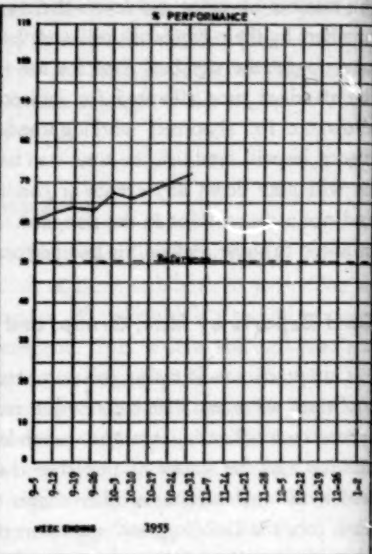


EXHIBIT 1

measured hours, we have the hours on measured work. From the job analysis sheet of these jobs, the standard hours are extracted and totaled to furnish the total standard hours produced. Dividing the hours on measured work by hours on completed jobs gives the per cent of coverage of standards. Dividing the standard hours produced by the hours on measured work gives the performance percentage by trades.

The information is posted to a weekly cost control report which furnishes to supervisors of trades or sections a recapitulation on the number of employees, total hours worked, per cent of coverage, per cent of performance when controls were applied (to show change), average performance percentage for the previous year, the average performance for the year to date, and the performance for the week. The report is also summarized by previous quarters. The performance percentage increase or decrease in efficiency is shown by graph, so that the foreman can readily judge his group. For higher level supervisors and top management, the weekly trade (skill) reports are summarized on a weekly cost control report and averaged to give an overall performance report for that part of the maintenance department under standards. In addition, the information on

the overall performance is posted on a graph weekly to show increase or decrease in per cent of performance or efficiency. An example of the report as it relates to trades is given in Exhibit 1. When used for periods rather than skills, the form differs slightly.

What is the purpose of these reports? They furnish our management the final link needed to control maintenance costs. Management can now remove the waste from historical costs. A yardstick has been constructed against which the cost of doing a job can be compared and conclusions drawn. In addition management can now judge the ability of supervision, from the foreman up. Just as the responsibility for spending money has been placed in the hands which must account for it in relation to a budget, so the responsibility for the efficient use of labor in maintenance has been placed on the people in the line in charge. Efficient methods must be used since wasteful methods will show up as a poor performance rate. This setup helps management to pick up weak points through unsatisfactory reports and to trace and correct them. Labor costs keep rising. More efficient use of labor assists in reducing the added cost.

A Measure of Maintenance Labor Effectiveness

We are in the middle of the application of this program on labor costs of maintenance at all our plants. Already we are showing increased efficiency. A psychological factor has ben introduced. In general, people tend to work harder when in competition, either against themselves or others. Most men take pride in their work and will strive for increased efficiency if a lack of it is proven to them. We are measuring the effectiveness of our labor to see if we are getting a good return on our labor dollar. Our method is no substitute for other controls but must be a supplement to them. Our studies cannot show us if we are doing enough maintenance work, if we are using materials effectively, if we are spending enough on maintenance. It does show us whether we have a good rate of return on money spent for maintenance labor in the dyestuff and chemical division.

Setting Incentive Standards for Material Handling

by GEORGE W. SHAW

Supervisor of Machine Control, Whitin Machine Works, Whitinsville, Mass.

The handling process about which this article centers is performed by tractor and trailor units, each with a driver and helper, or, depending on the job, low lift platform trucks. The process yielded quite readily to time-study under which an individual incentive system replaced a group incentive, a move which has resulted in marked efficiency improvements and greater satisfaction all around.

INDIRECT LABOR HAS been avoided and ignored as far as standards are concerned for too long a time. For some reason or other, it has always been considered unsystematic in character and too difficult (or impossible) to measure. But have we ever stepped in close enough for a real good look? It seems to me that we have always viewed it from a distance and, consequently, missed, in the overall picture that was visible, the many hidden consistent items. Lately, I think, we have been breaking down that distance barrier, stepping in closer for a better look, and finally realizing that this type of labor can be measured and with very good results.

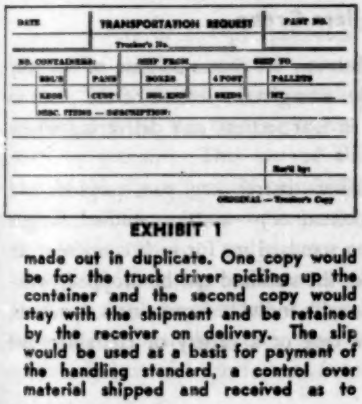
An example is our company's material handling problem. Two types of electric trucks, low lift platforms and tractor and trailers, are used to transport material from department to department during the various stages of its processing. This transportation was managed somewhat haphazardly. Material was put in any one of a variety of containers to be transported between departments by the electric trucks. Containers were very often misplaced and, when anything could not be found, the truck driver was automatically blamed. Material did not move as fast as it should, which interfered with planning and scheduling.

Something had to be done to correct the situation. The answer seemed to be an incentive system with adequate controls. On the surface it looked like an impossible job to measure the work involved, but it was decided to take a closer look at the problem. The only way to do this was to see what actually went on. Time was spent riding with the truck drivers as they carried out their duties and observing just what happened. This disclosed some of the most adverse conditions (to setting work measurements) you could run up against, but it also gave us an answer to our problems and how to go about correcting these conditions so that incentives could be established.

Decision to Install Individual Incentives; Preliminary Moves

At the time of the survey a group bonus was in effect. It had become outmoded because of changes which had taken place over the years, there was no way of controlling the manner of payment and the entire group of drivers was dissatisfied and was asking for a change. After a careful study of the findings in the survey of materials transportation and weighing the pros and cons of individual and group incentives, it was decided that an individual incentive system would be installed, involving establishing standard times and paying for earned hours on that basis. The following conditions were corrected and controls established before any time studies were made:

1. Aisles were marked off throughout the plant, which were to be kept clear at all times to eliminate the unnecessary travel interference as much as possible.
2. Loading and unloading stations were marked off in each department. Processed work would be picked up and delivered at these areas only. These stations were located as close as possible to the production clerk who was made responsible for everything received and shipped. The production planner was to see that the departmental trucker would deliver the incoming work to the processing machines in the department and take work back for shipping.
3. The types of containers used were screened and the various kinds reduced to a minimum variety to consolidate loads and facilitate handling.
4. A Transportation Request (Exhibit 1), which would be applicable both to tractors and trailers and to low lift platform trucks, was designed to be


TRANSPORTATION REQUEST

DATE

PART NO.

Trucker's No.

NO. CONTAINERS:

SHIP FROM:

SHIP TO:

BELT

PANS

BOXES

4 POST

PALLETS

SKIDS

CRATES

SKIDS

QTY.

MISC. ITEMS — DESCRIPTION:

Rec'd by:

ORIGINAL — Trucker's Copy

EXHIBIT 1

made out in duplicate. One copy would be for the truck driver picking up the container and the second copy would stay with the shipment and be retained by the receiver on delivery. The slip would be used as a basis for payment of the handling standard, a control over material shipped and received as to proper quantities with destination, and a record of which driver made the delivery.

5. Personnel responsible for shipping and receiving were instructed on the following:
   a. How transportation request slips should be made out and placed with work.
   b. How loads should be grouped and proper containers used when shipping.
   c. How incoming containers should be checked.
   d. What should be done when the destination and/or amounts received did not agree with the slip.
6. A truck drivers' Internal Material Transportation Daily Route Sheet (Exhibit 2) was designed for a record of departments serviced and a record of elevators used.
7. Truck drivers were instructed as follows:
   a. Containers will be picked up at loading stations only.
   b. Pick up only the number of containers listed and deliver them to the destination recorded on each transportation request slip.
   c. Keep one copy of the slip and record clock number on the copy which will remain with the work. Truck driver turns in his copies each day as the basis for payment of the handling standard.
   d. Record the number of each department on the route sheet, as a stop is made for a pick up and/or delivery.
   e. When using the elevator, have the elevator operator stamp the elevator number on the route sheet.
   f. Deliver at unloading stations only.

INTERNAL MATERIAL TRANSPORTATION DAILY ROUTE SHEET DEPT. 407

CLOCK NO. OPER. DATE

CLOCK NO. HELPER TRUCK NO.

TIME STARTED TYPE TRUCK

TIME FINISHED SHIFT

TRIP NO.	DEPT. NO.		ELEV. NO.	TRIP NO.	DEPT. NO.		ELEV. NO.	TRIP NO.	DEPT. NO.		ELEV. NO.	TRIP NO.	DEPT. NO.		ELEV. NO.
0				42				84				126			
1				43				85				127			
2				44				86				128			

EXHIBIT 2

Two Types of Trucks

As already indicated, the trucks, all of which are electric, are of two types. A tractor is a battery driven machine, pulling a low, flat-bodied trailer on which containers are loaded to be delivered throughout the plant. These containers are loaded and unloaded by hand or hoist by the driver and helper working as a team. A low lift platform truck is a battery-driven machine, its speed, direction and lifting mechanism controlled by the driver from a standing position at one end of the truck (a one-man job). These trucks are made to pick up large, heavy containers (box, double-ender, 4-poster, skid) constructed to allow the driver to run the platform of the truck under the container, lift it off the floor, carry it to the destination and set it down by truck power without any manual effort by the driver. (There were times when manual handled containers would be carried by these trucks. This occurred in isolated cases when rush work was to be moved immediately and the tractors and trailers were tied up.)

Standards for The Tractors and Trailers Group

Inasmuch as it was impossible to establish any set routes because of the way the plant is laid out, each tractor and trailer was given a section of the plant to cover and the responsibility for pick ups in that section, and delivering where called for.

Handling each individual type of container—barrel, keg, pan, cuspidor and miscellaneous item (a loose article not in a container)—was time studied, fatigue and interference factors allowed for, and a standard set for each container. In the future, if any container is discontinued, the standard can be dropped, without affecting the remaining standards. Also with individual containers standards, the conditions are equalized whether one type or a variety of containers are handled.

Further, a man-hour standard was set on handling so that, if at any future time the helper was eliminated or the driver worked alone, the standard would not be affected. Each day, transportation request slips picked up by each team of driver and helper are turned in to the dispatcher.

There are nine elevators in the plant which are used to get to different levels. Due to location some are in use more frequently than others. As it is impossible to tell which one would be used, each elevator was time studied separately, interference factors allowed for, and a standard set for each elevator. As the men had no control over this condition, the standards were established as an "each man rate", so that the driver and helper would benefit equally and the standard would not be affected in case one man worked alone. As each elevator was used, the driver had the elevator operator stamp his route sheet, which would be used as a basis of payment for the elevator standards.

As to travel, a meter was installed on each tractor, which recorded the distance travelled in feet. Each tractor and trailer was tested under working conditions and it was found that their speed and power varied. Taking this into consideration, along with fatigue and interference factors present, a standard was set. Because the tractor did the work and inasmuch as the driver and helper could do nothing to alter this, each should benefit equally. There was the possibility that one man might work alone. Taking all this into consideration, the standard was established as an "each man rate" which would cover all conditions. The dispatcher would set the footage meter each day and record the reading on the driver's route sheet when it was turned in at the end of each shift.

Standards for Low Lift Platform Trucks

The drivers of low-lift platform trucks work through the dispatcher. As calls come in, the dispatcher lines up a series of pick-ups and sends out the trucks. When the final load is delivered the driver telephones the dispatcher, notified him of the truck's present location and receives orders for another series of pick-ups. This method eliminates unnecessary time lost in running back to the dispatcher and permits better coverage of the plant. Incentives for low lift platform trucks were constructed of five standards: handling, regular item, inside item, trip, and elevator usage.

Although handling has been noted as an exception to the general rule for work for this type of truck, it does happen from time to time and has to be allowed for. Handling each type of container, by hand or hoist, was time studied, fatigue and interference factors allowed for, and a standard set. Trans-

portation request slips picked up by the driver are turned in to the dispatcher each day for application of the standard.

The regular item standard relates to a machine loaded container (box, double ender, 4-posted, skid), handled by this type of truck only, because they are picked up, carried between departments and put down by truck power without any manual effort by the driver. Trucks were time studied in handling these containers, interference and fatigue factors applied, and one standard set which covered any of these containers. As with handling, transportation request slips picked up by the driver are turned in to the dispatcher each day to evidence this work.

The term "inside item" means inside a department. There are times when the dispatcher is asked to have machine loaded containers moved and re-positioned within a department. This condition was time studied, interference and fatigue factors applied and a standard set to cover this condition. Transportation request slips for this work also are turned in to the dispatcher each day.

The trip standard concerns truck movement empty. There were times when these trucks would travel between departments without a container. This situation was studied and a standard set. The difference between the number of "regular items" for the day and the total number of department entries recorded on the route sheet are classified as trips to be credited against the driver.

Because the element, drive on elevator, is included in the travel time and covered by the footage meter on tractors and trailers, this element was added to the tractor and trailer elevator standards and standards set for low lift platform trucks when using elevators. As each elevator is used, the driver has the elevator operator stamp his route sheet.

Payroll Computation Procedure

The dispatcher records on the driver's route sheet the number of hours each driver is on incentive and any time spent at a special day-work job, attaches the transportation request slips and turns the sheet and slips over to the time clerk. When the standards were set, a Payroll Computation Sheet (Exhibit 3), which covers a period of one week, was designed for the time clerk. A sheet is made out for each driver (helpers' data would be identical) and information on the transportation requests and route sheets is posted daily, a weekly total extended and standards applied to arrive at earned hours. The earned hours column is totalled and divided by the actual hours worked to find the amount of bonus to be paid. Request slips and route sheets are filed away in daily groups.

PAYROLL COMPUTATION SHEET

Name:_____ Clock No.:_____ Driver:_____ Helper:_____ Week Ending:_____

Description	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total	Standard	Earned Hours
Tractors & Trailers										
Barrels, Regular									2.64 Hrs. /C Items	
Barrels, 406 M									4.24 "	
Barrels, Empty									2.19 "	
Kegs, Regular									1.99 "	
Kegs, Empty									1.79 "	
Pans, Regular									1.96 "	
Pans, Empty									1.82 "	
Cuspidors									1.83 "	
Misc., Regular									1.95 "	
Excelsior									2.78 "	
No. 40 41 or 42									.00912 Hrs. /C Feet	
No. 43									.01135 "	
No. 44									.00988 "	
Low Lift Platforms*										
*Similar to section above.										
Elevators										
No. 3 T&T									4.08 Hrs. /C Upes	
No. 3 LLP									4.42 "	
No. 4, 7 or 9 T&T									5.33 "	
No. 4, 7 or 9 LLP									5.67 "	
No. 5 T&T									6.61 "	
No. 5 LLP									6.95 "	
No. 10 T&T									97 "	
No. 10 LLP									1.31 "	
No. 14 or 16 T&T									3.71 "	
No. 14 or 16 LLP									4.05 "	
No. 18 T&T									3.16 "	
No. 18 LLP									3.50 "	
Incentive Hours									Earned Hours_____	
Day Work Hours										
Worked Hours										

EXHIBIT 3

Vanishing Inefficiencies

When the standards and controls were put to work, our problems began to disappear. Loose standards were eliminated and any possibility of padding was gone. A graph started prior to the project for each tractor and trailer showed very little footage covered and many containers handled in an erratic and inconsistent manner. These incidents dropped and leveled off with the standards. Loading stations were serviced more frequently and material moved faster. Very few containers were lost and, when this did happen, it was possible to trace them in a very short time, find out who was at fault, and place the blame where it belonged. Each man was on his own and the bonus he earned depended on his own efforts.

When the project was started, five tractors and trailers were used during the day and two at night. Within two weeks after the standards were in effect, one tractor and trailer was eliminated on the day shift and only one was used on the night shift, and that part time.

In short, what appeared to be an impossible task at the start turned out very satisfactorily. Above all, the installation proved that this type of labor can be measured and with very good results if we only move in and get close enough to it.

A Review of the Effects of "Lifo" Inventory Valuation Upon Profits

by E. G. FIELD

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Noting the absence of any but occasional price declines in cotton since the time that the "lifo" basis of inventory valuation became available for tax purposes and noting also some of the reasons for this, the present author draws attention to the original compensatory purpose of this method of valuation, its major effects thus far, and exemplifies its results under the three situations of stable, rising, and declining cotton prices.

THE SYMBOL "lifo" is used to designate an inventory that is priced according to the plan of "last-in, first-out", i.e., the inventory is regarded as moving in reverse to the order of acquisition. It is in contrast to the "fifo" method, where the inventory is priced according to the plan of "first-in, first-out". The "lifo" method has a brief history. Prior to 1939, various plans for inventory cost were in use for income tax purposes. The law was changed by Congress on the request of certain industries to permit some corporations to select the "lifo" plan as a means through which they could somewhat level their taxable earnings in periods of price changes. The purpose was to permit companies to avoid spending cash to pay abnormally high income taxes on profits computed by use of a high priced closing inventory in periods of inflated prices. Permission to use the "lifo" inventory plan was subsequently broadened and it is now employed in many different manufacturing and mining industries and in some retail stores.

Nevertheless, the effect of "lifo" inventory on profits seems to be often overlooked or even misunderstood, especially in respect to price declines. When the inventory is large in quantity relative to the sales, the method of inventory pricing has considerable effect upon the earnings. In years during which raw material prices decline, the "lifo" inventory results in showing higher earnings than could be expected from using actual costs. In consequence, the statements then show more earnings than could be expected from the predictions of economic reports. The present article comments on this situation.

What About the Declining Market?

Since the time that the election of the "lifo" plan of inventory valuation be-

came available to taxpayers, many corporations have found it advantageous. During most of the years, the commodity market prices have been going upwards. The rising trend in commodity prices has been shown in the daily statistics published by various business and trade papers, showing spot and future commodities. A definite example may be taken from the tabulation of spot cotton prices, furnished by the Department of Agriculture as weighted averages by sales. Inasmuch as many of the cotton mills close their annual operations at dates near the end of the cotton year, the average price in July has been selected for comparison, thus:

July Average Price of middling 15/16 Inch Upland Spot Cotton on 10 Designated Southern Spot Markets

Year	Price	Year	Price
1938	8.83*¢	1947	37.52¢
1939	9.37*	1948	34.01
1940	10.19*	1949	32.09
1941	15.58	1950	37.12
1942	19.42	1951	40.07
1943	20.85	1952	39.39
1944	21.64	1953	33.36
1945	22.59	1954	34.42
1946	33.40	1955	33.79

*was Middling ⅞ inch

This list shows a long and continuous price rise for many years, with three short periods in 1948 and 49, in 1952 and 53, and in 1955, of declining prices. During this period as a whole, managers of mills using "lifo" learned that increasing their inventory quantities under rising prices helped to reduce the profits due to be paid out as income tax in that year. Many mills kept increasing the quantity in the inventory as a means of reducing taxable net profits. The effect of this practice was to considerably decrease the profits then being reported in the annual operating statements. However, the opposite result can be expected to take place during periods of falling prices for raw material. Profits will be shown to have increased under "lifo". It is the effect of this showing of increased profits during falling market prices, which is not generally understood.

"Lifo" and "Fifo" Under Stable, Rising, and Declining Prices

To show the effect of replacement purchases at different market levels, a hypothetical illustration will be presented. Three conditions will be included: (1) market prices steady, (2) market prices up, and (3) market prices down.

For comparative purposes, the "lifo" results will be contrasted with the "fifo" results. All three situations will make use of the same pounds of material and the inventory will be kept constant in pounds. This simplifies the comparison of results. The uniform quantities will be:

Particulars	Pounds
Purchases	5,000,000
Inventory at start	2,000,000
Purchases available	7,000,000
Inventory at close	2,000,000
Materials	5,000,000
Labor and expense	do
Cost of sales	5,000,000

In each of the selected three instances, earnings under the "fifo" plan will be kept the same, so the purchases will have to change in order to provide the closing inventories at the three selected price levels. This difference in closing inventories and purchases is presented:

Purchases at "Fifo" Cost	Case 1	Case 2	Case 3
Closing inventory in pounds	2,000,000	2,000,000	2,000,000
Closing inventory price	30¢	40¢	20¢
Inventory at close	$ 600,000	800,000	400,000
Inventory at start	600,000	600,000	600,000
Increase (decrease)	—	200,000	(200,000)
Materials in cost of sales	1,500,000	1,500,000	1,500,000
Purchases	$1,500,000	1,700,000	1,300,000

The first column of figures applies where there is no change in the inventory prices during the period, the closing inventory being valued at the same amount as the starting inventory. This situation illustrates the basic comparison of operation results when market prices are steady, thus:

	Case 1		
	"Fifo"	"Lifo"	Decrease
Purchases	$1,500,000	1,500,000	—
Inventory at start	600,000	200,000	400,000
Purchase available	2,100,000	1,700,000	400,000
Inventory at close	600,000	200,000	400,000
Materials	1,500,000	1,500,000	—
Labor and expense	2,250,000	2,250,000	—
Cost of sales	3,750,000	3,750,000	—
Net sales	5,000,000	5,000,000	—

Gross profit	1,250,000	1,250,000	—
Selling and administration	750,000	750,000	—
Net profit	500,000	500,000	—
Income tax	300,000	300,000	—
Net earnings	$ 200,000	200,000	—

It is important to notice at the outset the very substantial difference between the cost of the inventory in the "fifo" and the "lifo" plans, in that the "lifo" price at 10 cents a pound was determined several years previously on a much lower priced market. However, it is also to be noticed that there is no difference in the cost of sales, net profit, and net earnings as between the "fifo" and "lifo" inventory valuation basis. They give the same results because the difference between "fifo" and "lifo" in the starting inventories is offset by a similar difference in the closing inventories.

The second situation illustrates the conditions brought about by rising prices. The "fifo" closing inventory is at 40 cents a pound whereas, the starting inventory was at 30 cents per pound. This is the condition that has generally applied during most of the cotton crop years since "lifo" was made available to the cotton mills for income tax purposes. The results under this situation are arranged in the same order as in the prior one, and show:

Case 2

	"Fifo"	"Lifo"	Decrease (Increase)
Purchases	$1,700,000	1,700,000	—
Inventory at start	600,000	200,000	400,000
Purchase available	2,300,000	1,900,000	400,000
Inventory at close	800,000	200,000	600,000
Materials	1,500,000	1,700,000	(200,000)
Labor and expense	2,250,000	2,250,000	—
Cost of sales	3,750,000	3,950,000	(200,000)
Net sales	5,000,000	5,000,000	—
Gross profit	1,250,000	1,050,000	200,000
Selling and administration	750,000	750,000	—
Net profit	500,000	300,000	200,000
Income tax	300,000	180,000	120,000
Net earnings	$ 200,000	120,000	80,000

Here it is noticeable that the $300,000 of net profit as shown under the "lifo" valuation basis is $200,000 lower than the net profit of $500,000 that is shown under "fifo". Correspondingly, the income tax has been substantially lowered when using the "lifo" plan and the net earnings carried to surplus are shown as $120,000, which amount is $80,000 or 40 per cent lower than under "fifo". This difference in net earnings is quickly explained. The closing inventory

difference, as between these two methods of valuation, was $600,000 as compared with only $400,000 difference in the starting inventories. This results in the $200,000 more for the cost of sales when using "lifo". It reduces the gross profit by $200,000 and takes that amount out of the taxable net profit. In turn, the income tax is $120,000 lower. Thus net earnings are $80,000 or 40 per cent lower. In brief, the income tax and net earnings both have been substantially lowered by "lifo" in the situation of rising market prices.

The third situation is the opposite of the second one in that the "fifo" closing inventory has been replaced at 20 cents per pound, which is well below the starting price of 30 cents per pound. This is the condition, i.e., replacement at a lower price, that has applied in only a few of the years which have past since "lifo" was first put into general use.

This situation is presented like the others, thus:

Case 3

	"Fifo"	"Lifo"	Decrease (Increase)
Purchases	$1,300,000	1,300,000	—
Inventory at start	600,000	200,000	400,000
Purchases available	1,900,000	1,500,000	400,000
Inventory at close	400,000	200,000	200,000
Materials	1,500,000	1,300,000	200,000
Labor and expense	2,250,000	2,250,000	—
Cost of sales	3,750,000	3,550,000	200,000
Net sales	5,000,000	5,000,000	—
Gross profit	1,250,000	1,450,000	(200,000)
Selling and administration	750,000	750,000	—
Net profit	500,000	700,000	(200,000)
Income tax	300,000	420,000	(120,000)
Net earnings	$ 200,000	280,000	(80,000)

Now the "lifo" net profit of $700,000 shows as $200,000 more than under "fifo". Correspondingly, the income tax has been substantially increased by using "lifo" under these circumstances and the net earnings carried to surplus are $280,000, which is $80,000 or 40 per cent more than would be applied under "fifo". Again, the explanation is readily given. The closing inventory difference of $200,000 between the two inventory valuation plans, as compared with the $400,000 difference in the starting inventory, has resulted in the cost of sales being lowered by $200,000 under "lifo" plan. The taxable net profit was increased by $200,000. This increased the income tax by $120,000, and in turn, has raised the net earnings by $80,000 or 40 per cent under "lifo" during declining market prices. Here, income tax paid and net earnings reported both have been substantially increased while using "lifo".

Effects of "Lifo" — Intended and Unintended

The "lifo" case illustrations, which have been given, show definitely that the taxable profits are cut down by use of "lifo" when the cotton market has gone up during the year and the taxable profits are stepped up under "lifo" when the cotton market goes down during the year. Thus, under the "lifo" inventory plan, there is expected to be a switching of tax payments as between some years. When market prices have gone up during the year and more money is necessary to carry the higher priced inventory, the "lifo" taxpayer is permitted to pay a lower amount of tax to the Government until the year when the market has declined and the same inventory quantity can be carried with less money. This is an advantage available to the taxpayers according to their election.

Many mill managements have in fact, found the "lifo" basis of inventory valuation to be advantageous. This is especially true because the cotton market has continued going up in most of the years during which "lifo" has been available. These mills have built up a considerable profit deferment through the amount of money which represents the difference between the current market value and the "lifo" book value of the inventory. When markets are going up, it is relatively easy to collect the full price from cloth and yarn customers, and the mills have collected both the income taxes and their part of the profits from the customers. In fact, sometimes the mills have collected at higher tax rates (war-time), including income tax, excess profit tax and renegotiation. Hence, when tax rates were lower, some of what was regarded as ultimately tax money was permanently left to the mills. This retained money has been used to reduce loans, to increase inventory, to replace old machinery, to expand plant facilities, and to buy other mills. This has facilitated some of the mergers and the growth of some companies.

On the other hand, valuing inventory on the "lifo" basis during rising prices has resulted in temporarily showing a lower inventory book value for the stockholders' interest. If they sold their stock on book value, they may not have received the full economic value for it. This situation may have made it easier for the big mill with large cash accumulation to buy some smaller mills at attractive prices.

The "lifo" inventory plan is an attempt to accomplish the averaging of earnings in years of fluctuating markets. Raw material prices naturally fluctuate sometimes up and sometimes down. However, the "lifo" method has been applied during periods of political practices which have been purposely intended as inflationary through the introduction of parity prices to the farmers in exchange for restricted production, of progressively increasing minimum wages

so as to prevent prices in general from going back down, and of certain other plans purposed to devalue the dollar. There has been no free economy of normal supply and demand relations. Thus, inflation has prevented the "lifo" inventory plan from operating as originally intended. Under the "lifo" plan, the inflation certainly has been profitable to the mills.

On the other hand, there have been some disadvantages in that the higher prices for natural fibers have encouraged the production of synthetic fibers that have taken an important part of the fabric industry. Mills that have used the money which would have gone to pay the mill income tax and, instead, have applied it to invest in equipment, now may find it quite difficult to obtain new profit under falling markets, to free the tax money which will be necessary if commodity markets are allowed to decline. In this situation, the "lifo" method operates to enhance profit showings. Likewise, in times of difficult operations, with increased competition under falling prices, there may be a problem in paying cash dividends from the newly reported earnings that may be brought about from using the "lifo" plan in declining markets.

Mills that have not used the "lifo" inventory plan should have shown proportionately larger earnings during the many years of climbing cotton prices. In years when cotton has declined, then the mills on "fifo" have shown correspondingly lower profit or more loss. So it is important to know which mills have issued operating statements using "lifo" inventories, if comparative statistics are to be useful.

If the commodity market, including cotton, cannot be allowed to decline for political reasons, then the variation must all be on the upper side and there still may be an opportunity for more mills to go under the "lifo" inventory plan for tax purposes. Of course, some day, the national prices for cotton in the bale must get down closer to the free world prices, but that is another question, i.e., one of economics.

We have been examining how the "lifo" inventory plan has and does affect mill profits. From the points made, it should be possible to appreciate why there has been some confusion in understanding the peculiarities of the taxable profits under the "lifo" arrangement. There has been an advantage going to the mills that selected the "lifo" plan. This is not any fault of the underlying theory of "lifo", which has not been permitted to work as originally intended. The political purpose of inflationary prices has been very helpful to the mills which availed themselves early of the opportunity offered by adopting the "lifo" plan. Whether that advantage will be continued with more inflation or reversed and made into a disadvantage through marked price declines, remains to be seen.

Since, as pointed out, political inflationary policies have prevented the "lifo" inventory arrangement from working as originally intended, there are several questions to be answered. Here are three questions, not answered in this article, which are presented in closing, as a stimulus to thinking on the topic:

1. How should the "lifo" taxpayer, for his own information, ear-mark the tax collected from customers, that is not yet legally due to the Government, so that this cash will not become extensively mixed with the taxpayer's funds and expended on fixed investments?
2. How is the Government finally going to obtain this tax money, that has been collected from customers over many years and is being used by the taxpayer in his business without any payment for interest?
3. How is the Government going to reduce the tax rates and balance the budget while continuing to finance "lifo" taxpayers, to finance commodity loans to the farmers at prices in excess of those in world trade, to further increase costs by raising minimum wages, and to encourage the imports of competitive and lower cost merchandise?

Government Contract Terminations—Comparison of ASPR and JTR

by A. O. KAMMAN

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Defense contracts continue to be "terminated for the convenience of the government" for a variety of reasons and contractors have a like continuing interest in the provisions of the Armed Services Procurement Regulation (ASPR) which take the place, generally speaking, of the Joint Termination Regulations (JTR) in effect at the close of World War II. However, industry as a whole may be somewhat more familiar with the earlier provisions. In this article, the author—familiar with both—makes pertinent comparisons and differentiations, together with survey coverage of the rules now in effect.

MANY CONTRACTORS today are faced with the problem of what to do about terminations of Government contracts. Recalling their experiences at the end of World War II, when the impact of mass terminations was a matter of deep concern to all contractors who were involved in Government contracts, some are now concerned about the prospect of handling terminations with personnel inexperienced in the complex procedure involving determining claim costs and preparing settlement proposals. Contractors who dealt with this subject ten years ago are likely to find that the people who worked for them on terminations then have either left their employ or are now in different spheres of activity. It is generally conceded that the "wholesale" termination of all Government contracts, as at the end of World War II, is not probable at this time, but selective and partial terminations are definitely a factor to be considered. This situation may continue for a number of years and the pattern may vary as the strategy of defense is revised to meet changed conditions. The complexity of this subject and the fact that special rules apply make it important to look at the regulations under which such terminations will be settled.

The Contract Settlement Act of 1944 applied to War Contracts, which were defined as contracts placed by agencies authorized to enter into contracts under the First War Powers Act of 1941. However, most of the present contracts with the military departments of the United States Government have been made under the authority of the Armed Services Procurement Act of

1947. The 1947 Act does not specifically mention terminations but, under the authority of the Secretaries of the Army, Navy and Air Force, the Armed Services Procurement Regulation (ASPR) Section VIII, Termination of Contracts, was issued in January 1952. Section VIII of ASPR sets forth the rules under which terminated Government contracts will be settled. ASPR Section VIII was adopted as part of the directive system of the Secretary of Defense by Department of Defense Directive 4105.30, dated December 1, 1952. Except for contracts entered into specifically under the First War Powers Act of 1941, which are subject to the Contract Settlement Act of 1944 under which the Joint Termination on Regulations (JTR) were issued, it may be generally considered that terminations of Army and Air Force contracts executed after November 1, 1947 and Navy contracts executed after May 19, 1948, will be settled under ASPR Section VIII.

Questions have been raised as to the finality of settlements negotiated under ASPR VIII. This appears to be covered in ASPR 8-302, Authority of Contracting Officers, and in the termination clauses prescribed in ASPR 8-701, 8-712 (art. 5) and 8-712.2 (art. 5). However, there is concern in some quarters that, without more specific action by Congress, such as was taken in passing the Contract Settlement Act of 1944, these settlements may not be final even when incorporated in a supplement to the contract.

In order that there be no misunderstanding regarding the use of the word terminations in this article, its use is limited to termination "for the convenience of the Government." It is not intended to include in this outline matters pertaining to claims which come under the "changes" article in contracts or terminations for default, completion of performance, or other transactions which may involve invoking the provisions of ASPR Section VIII. Examples of the last-named exclusion are the disposal of surplus and residual material on government contracts or of government property other than that arising out of terminations for convenience of the Government. For briefness and because it is the area of greatest interest, we have limited this article primarily to the subject of terminations of fixed price supply contracts.

General Comparison of ASPR Section VIII and the JTR

ASPR Section VIII which is commonly referred to as "ASPR Eight" is patterned to a considerable degree after the JTR. It prescribes the basic rules governing the terminations of contracts, disposition of inventory, settlement of subcontractors' claims, determination of costs and credits, and the settlement of net claims of prime contractors. Probably partly as a result of the experience gained from settling

claims under JTR and partly due to changed conditions and opinions, ASPR Eight incorporates several changes from the former policies and practices. It is not practicable to cover in this article all of the requirements of ASPR Eight, nor all of the changes from JTR, but some of the more significant changes affecting settlements and certain portions which appear to need clarification between the contractor and the contracting officer will be mentioned. It should be clear that contractors' experiences under JTR will be very valuable in dealing with terminations under ASPR Eight, provided due recognition is given to the differences between the two regulations.

For instance, it is readily noticeable that there is an important basic difference in concept between ASPR Eight and the JTR. The latter was designed essentially to effect speedy, equitable and final settlement of claims under terminated war contracts, both during and at the end of World War II. With this objective, the JTR (par. 215) provided that default contracts could be terminated "for the convenience of the Government" when the chief of the service or bureau charged with the administration of the contract considered the default of the contractor was not gross or willful and did not cause substantial injury to the Government and provided also that, at the end of hostilities, all contracts terminated were terminated "for the convenience of the Government", even though the contractor was in default, if the termination was simultaneous with, a part of, or in connection with, a general termination of all or substantially all of a group of contracts for the same or closely related products, or war contracts terminated generally at or following the cessation of hostilities. This is not so under ASPR Eight.

There is another basic difference. During and after World War II, cost memoranda implementing the JTR were issued under Office of Contract Settlement Regulation 14. These cost memoranda helped materially in reducing controversial opinions in the application of the cost principles stated in JTR, since the cost memoranda were uniformly observed by all of the Services and the Contractors. No such implementing interpretations are being issued under ASPR Eight, with the result that there is more possibility of disagreement because of different inferences, however sincere, drawn by individual contractors, cost inspectors, and contracting officers, as well as possible differences in implementing instructions issued by the several branches of the Armed Services.

Nevertheless, the really fundamental standards for settling claims on terminated fixed price contracts have not changed. The general premise is that a termination claim settlement is not considered to be within the province of a sale ordinarily made by a con-

tractor but is, rather, a recovery of costs incurred on the terminated portion of the contract, plus reasonable compensation for the effort expended and the risk taken by the contractor. Because it is recognized that fair compensation is inherently a matter of judgment and cannot be exactly measured, it is provided that settlement by agreement or negotiation shall be used to the greatest possible extent. Cost and accounting data are to be used as a guide in formulating opinions as to the amount of settlement to which the contractor should be justly entitled, but not as a rigid measurement of the amount due him.

Settlement proposals, for which forms are prescribed in ASPR Eight, must be submitted within two years after the date of termination, unless an extension of time is agreed to by the contracting officer. In the absence of such an agreement, if the settlement proposal is not submitted within the allotted time, the contracting officer may unilaterally determine the amount of settlement. Where the settlement determined by the contracting officer is considered by the contractor to be inequitable, he may appeal under the "disputes" clause in his contract.

Basis for Settlement of Contracts Under ASPR Section VIII

ASPR 8-401 entitled "General Standard for Use of Cost Principles", and ASPR 8-504, "Fixed Price Contracts-Negotiated Settlements", appear to be sufficiently broad enough to preclude the likelihood of negotiating a settlement purely on the basis of meticulously audited costs incurred on the prime contract, plus a fixed percentage of profit markup. These broad principles will permit contracting officers to discharge the responsibility of safeguarding the interests of the Government and at the same time allow them to exercise discretion and judgment in negotiating the settlement of termination claims.

Ordinarily, the inventory basis of preparing a settlement proposal will be used, unless there are urgent reasons for using another method. This method requires preparation of lists of all termination inventory, that is, all material allocable to the terminated portion of the contract except that which is diverted to the contractors' own use or returned to suppliers, at no cost to the Government. Minor costs of handling and shipping and, in the case of returns to suppliers, the suppliers' restocking charge, which may not exceed 15 per cent of the cost of the material, may be allowed.

These inventory lists are evaluated at incurred shop or purchase cost. Where a standard cost system of accounting is used, incurred shop cost represents standard cost adjusted for variations. To the total inventory costs are added other costs allocable to the terminated portion of the contract, such as special engineering, prepara-

tion cost, loss on leases, loss of useful value of special machinery and equipment, high start up or initial costs, amounts of net settlements with subcontractors, expenses incurred as a result of termination (post termination expense), general and administrative expenses, and compensation (profit) for the contractor.

There is no established formula for deciding the amount of profit which may be allowed in a claim settlement, except in cases of unilateral settlement by determination, where a profit formula is used comprising a combination of 2 per cent of the cost of raw material and purchased parts, 8 per cent on work in process and a limitation of 6 per cent on over-all profit. No profit or expense markup will be allowed the contractor on amounts of settlements with subcontractors or on post termination effort, nor will any profit be allowed in cases in which it is considered that the contractor would have suffered a loss on the contract had it not been terminated.

ASPR 8-404, "Allowance for Profit on Fixed Price Contracts-General", is identical with JTR 533, except for the addition of ASPR 8-404.2, "Other Factors to be Considered". Generally, these provisions should permit the contractor and the contracting officer to negotiate a fair allowance for profit. ASPR 8-404.1, "Proportion of Agreed Profit", subparagraph (2) specifically mentions several considerations which could enter into the calculation. This should dispel any tendency to measure profit on a percentage of cost basis alone.

Although ASPR Eight excludes subcontract settlements and post termination expense from the base for computation of profit, as did the JTR, there is a point to be noted here. It is a possibility that the contractor may spend considerable effort in settling with subcontractors and in diverting (at no cost) much of the inventory, resulting in a claim consisting of a large proportion of subcontract settlements and a small proportion of direct prime contract costs. Thus, his normal base for markup will disappear. Although the amount of profit negotiated should include consideration of these facts, it is entirely possible that under these conditions, the contractor might not be successful in negotiating a profit in his settlement commensurate with the effort he expended. On the other hand, consideration may be given by the contracting officer to the fact that the contractor used his personnel and organizational ability to effect expeditious settlement of the termination claim and that he may be entitled to a return for this effort, inasmuch as similar effort expended in his regular business activities would probably have realized a profit. The point to be remembered is that the termination is "for the convenience of the Government" and is neither a fault of, nor desired by, the contractor. The amount of profit allowed is purely a matter for

negotiation between the contractor and the contracting officer.

Cost Principles Set Forth in ASPR Section VIII

Although, elsewhere, the ASPR does not prescribe cost principles for fixed price contracts, ASPR Eight contains a statement of cost principles which are to be used as a guide in considering the eligibility of costs used as a basis for negotiating claim settlements. These cost principles state certain policy determinations regarding the types of costs which should ordinarily be taken into account in arriving at a fair and equitable settlement of the contractor's claim. They are intended to include all direct and indirect costs incurred which are reasonably necessary for the performance of the terminated contract. In applying these principles, consideration is to be given to reasonableness, generally accepted sound commercial accounting principles and practices, the established accounting procedures of the contractor, any limitations or special provisions in the contract or in the written cost analysis which was used as a basis for price in the contract negotiations as to types and amounts of costs, quantities of material on hand at the date of termination (with regard to lead time required to meet delivery schedules), and allocability of the costs to the portion of the contract which was terminated.

ASPR 8-402, "Statement of Principles for Consideration of Costs," sets forth policy for treatment of specific areas of costs, comprising material, labor and expenses, both direct and indirect. These basic policies correspond, in general, to the practices under the JTR, but the specific examples of costs which may be included, as well as those that may not be included, have been stated more extensively than they were earlier. The ASPR retains the provision of the JTR which limits the aggregate amount of initial costs and preparatory expenses, loss of useful value on special machinery and equipment, experimental, research and development expense, special leases, and engineering, development and special tooling costs, to the amount which would have been available from the contract price to cover these items if the contract had been completed, after considering all other costs which would have been required to complete it. The provisions of ASPR 8-402 d which is entitled "Limitation of Certain Costs" are similar to that of the former JTR 551.2 (i). However, the JTR was implemented by a cost memorandum (No. 5) issued under Office of Contract Settlement Regulation 14 which stated:

> ". . . the limitation . . . is for application only in those cases it is determined that the contract would have resulted in a loss if it were completed, considering the costs subject to limitation in such determination, . . . the amount available from contract price . . . is the difference between (1) the contract price and (2) the estimated total of all costs other than those sub-

ject to limitation, which would have been required to perform the entire contract. . .".

Under this interpretation the formula for determining the amount allowed was:

1. Total estimated cost for the entire contract, exclusive of costs to which the limitation applies.
2. Contract price.
3. Aggregate amount of allowable limited costs (2 minus 1).
4. Apportionment of "3" between the cancelled and the uncancelled portion of the contract.

Adjustment for Loss: Limitation on Amount of Settlement

Adjustment for Loss, which is the subject of ASPR 8-403, provides for an adjustment of the settlement at an "indicated rate of loss" when the termination involves a potential losing contract. This is a new provision. It was not in the JTR. The formula (Army Audit Agency) for determining the indicated rate of loss is:

1. Costs incurred to date of termination.
2. Estimated cost to complete the contract had there been no termination.
3. Total estimated cost (1 plus 2).
4. Total contract price.
5. Estimated loss (3 minus 4).
6. Rate of loss (5 divided by 3).

This provision is not intended to duplicate the adjustments made under the provisions of ASPR 8-402 d, "Limitation of Certain Costs", and care should be taken that cost allowed in the claim which have been already reduced under those provisions are not subsequently reduced further when an adjustment of the settlement for an indicated rate of loss is made. It is understandable that the Government should not wish to underwrite a contractor's losses. Hence, the new provision may lead to differences of opinion, as to its application, particularly in cases in which the termination occurs prior to major or extensive deliveries on the contract, because it is not always possible to determine that the contractor would assuredly have suffered a loss had the contract been completed.

It may be debatable whether the indicated rate of loss at the date of termination would necessarily have been the actual rate of loss for the total contract, had it been completed. It would be logical to assume that the contractor, aware of how his costs were running on the contract, could have been able to improve performance, had the contract continued to completion, so that no loss or a slighter one would have been sustained by him. Also, inasmuch as termination provides an opportunity to divert material to other work of the contractor at "no cost to the Government", it is possible that removing such costs from the terminated contract might, under certain conditions, convert a potentially losing contract into a contract on which no loss would occur. Moreover, there is the possibility that the costs in relation to price for the particular contract items cancelled would reflect a profit, even though the contract as a whole

indicated a loss possibility, in which case the application of the above formula would appear to require some modification.

"Limitation on Settlements" is the province of ASPR 8-507 and prohibits arriving at a total settlement which, together with payments made or to be made on the contract exceeds the contract price, except for settlement (post termination) expense. A similar provision was also in the JTR. This limitation, together with the limitation of certain costs and the adjustment for indicated rate of loss would appear to amply protect to Government from "bailing out" the contractor. In addition to these restrictions, termination settlements are generally subject to renegotiation.

Composition of Termination Inventory

"General Policy for Treatment of Costs as Related to Specific Areas", given in ASPR 8-402 a, states that material claimed to be termination inventory for which costs are included for consideration in settlement must be properly allocable to the terminated part of the contract as to type and quantity. There is no mention here or elsewhere in ASPR Eight of the basis for determining allocability as to quantity in the case of a partial termination. The burden of proof of allocability rests with the contractor and the termination inventory must be on hand and within the reasonable quantitative requirements of the contract.

It is not necessary to take an actual physical inventory of all material on a contract at the date of termination in cases of partial termination. An allocation between the terminated and unterminated portions of the contract may be made upon any reasonable basis, such as engineers' estimates, manufacturing layouts, established stock records systems which conform to accepted commercial standards, and other reasonable criteria. However, it should be remembered that, when the entire uncompleted portion of a contract is terminated, the total of all remaining material on hand may not necessarily be applicable to the terminated portion of the contract. Some of it may be surplus and residual material applicable to the completed portion of the contract. When an allocation has been made, it is desirable to make a complete physical count of the portion which is termination inventory.

Other Costs Dealt with in The ASPR

ASPR 8-402 a, (1) (c) (2), states that, whenever items ordinarily chargeable as indirect costs are considered as direct costs, the cost of similar items applicable to other work of the contractor must be eliminated from the indirect costs apportioned to the contract. For example, if a type of cost, such as traveling and living expenses of field engineers, is charged as a direct cost to the contract, the general and administrative expense rate should

be modified to ascertain that the same classification of cost is not also included as an indirect cost resulting in duplication of such costs.

In the list of "Specific Examples of Costs Which May Be Included", contained in ASPR 8-402 b, it is stated in sub-paragraph (8) that costs of engineering, development and special tooling may be included to the extent they are allocable to the contract, provided that the contractor protects the interests of the Government by transfer of title or other means. It is not too clear precisely what is meant, but it is assumed this deals with costs such as shop engineering, machine design and facilities (other than industrial machinery and tooling which is capitalized) charged to a contract as preparation cost.

Generally, interest on borrowings is not accepted by the Government in costs used as a basis for price. ASPP. 8-402 b (14), however, lists interest on borrowings as an allowable cost but it does not precisely state whether this includes an apportionment of interest on all borrowings made for the purpose of conducting the contractor's business or is intended to be limited to interest on borrowings specifically related to the contract or the terminated part of the contract.

ASPR 8-402 b (27) includes as settlement expense (post-termination expense) storage, transportation and other costs incurred in protecting and disposing of termination inventory, but ASPR 8-602.1 and ASPR 8- 602.2 provide for including similar costs as "other costs" in the settlement proposal. If possible, it would be desirable to treat these costs uniformly as post termination expense, inasmuch as that is the nature of the costs and treating them as "other costs" penalizes the contractor with respect to limitation provisions of ASPR 8-402 r, ASPR 8-403 and ASPR 8-507, previously mentioned. It is recommended that an agreement be reached with the contracting officer toward this conclusion.

Settling with Subcontractors

The prime contractor is basically responsible for settlements with his subcontractors. The basis for settling claims of subcontractors was less flexible under ASPR Eight as originally issued than it was under the JTR, but recent revisions of ASPR Eight have reinstated the "short form" settlement proposal for claims under one thousand dollars and the authority which may be granted to the prime contractor to conclude settlements with subcontractors up to one thousand dollars gross claim value has been raised to a maximum of ten thousand dollars, as it was under the JTR. This authority may be obtained from the contracting officer upon approval of the head of the procurement activity involved. Except where authority has been given in writing to conclude subcontract settlements, each subcontract settlement must be submitted to the

contracting officer for approval before payment is made, unless the prime contractor is willing to assume the risk of loss in the event subsequent ratification by the contracting officer is withheld. This applies to disposition of material as well as to other factors entering into the decision as to the amount of settlement.

Disposition of Termination Inventory

Disposal of termination inventory under ASPR Eight is made substantially as under the JTR, except that formerly there was no requirement for competitive bidding before sales could be made. ASPR Eight originally required competitive bidding on all material disposal sales except those of minor consequence, but a recent revision permits the contracting officer to authorize sales of termination inventory without competitive bidding whenever, in his opinion, such disposal is essential in the interest of making a fair and prompt settlement, provided the interests of the Government are adequately protected and the sale is at a price that is fair and reasonable and not less than the proceeds which could have been expected if the property were offered for competitive sale at that time. The Government retains the right to take title to any termination inventory which it requires. Usable and serviceable material is subject to a screening procedure. ASPR 8-606, which covers this requirement, does not provide for a written notification by the contracting officer to the contractor stating which portions of the termination inventory will be screened and which will not be screened, but it is recommended that this information be requested.

A plant clearance period is prescribed in ASPR 8-604, beginning with the effective date of termination and ending sixty days after delivery to the contracting officer of acceptable inventory schedules covering all items of a particular property classification, unless the period is extended by mutual agreement. At any time after expiration of the plant clearance period, the contractor may submit a list, certified as to quantity and quality, of any or all items of termination inventory for which disposition has not been made or authorized and request the Government to remove the material. The contractor may serve notice that he will remove and store the material at the expense and risk of the Government. ASPR 8-606.2, prescribes the screening period. As presently provided, the plant clearance period and the screening period run concurrently and, if the contractor were to enforce his right to remove and store material at the expense of the Government, he might be handicapped in selling or otherwise disposing of termination inventory.

It is possible that some clarification may be needed covering the responsibility for disposition of material. Al-

though the contractor has the primary responsibility under ASPR 8-601.1 (b) and ASPR 8-602 to sell termination inventory, this is certainly not solely his responsibility and, if for any good reasons he is unsuccessful in selling the material, he has the right to store it at the expense and risk of the Government, under ASPR 8-612.3, which provides for entering into storage agreements with contractors for protection and preservation of termination property not otherwise disposed of, but most contractors do not have large areas of storage space in excess of the needs of the business and, therefore, demand upon the contractor for this is dependent upon his willingness and ability to perform.

Another area dealing with material disposal which may need clarification is the responsibility for subcontractors' termination inventory. ASPR 8-614.1 (a) states that the prime contractor and each subcontractor is primarily responsible for disposing of the termination inventory of his next lower tier subcontractor. This does not mean that the contractor is required to sell or dispose physically of the termination inventory of his subcontractor. It should be clearly understood between the contractor and the contracting officer that responsibility for disposition rests with the contractor and that actually effecting disposition rests with the subcontractor who has possession of the property.

Partial Payment Provisions

ASPR 8-522 on "Partial Payments upon Termination", provides for making partial payments to the contractor upon his written application, provided the terminated contract authorizes partial payments and the contracting officer approves them. These payments may be made at any time after submission of partial or complete settlement proposals. Partial payments to subcontractors are made only through the prime contractor.

There is a problem with respect to interest payable to the Government on amounts of excess partial payment. ASPR 8-522.6 "Limitation on Total Amount; Effect of Overpayment", is not in conformity with the agreement which the contractor is obliged to to sign when submitting form DD548, "Application for Partial Payment." The DD548 form provides that interest shall be paid from the *date of demand* unless paid within a 10 day grace period, to the date of repayment on amounts which become excessive as a result of material disposal and diversion, whereas ASPR 8-522.6 provides for interest to be computed from the *date these amounts became excessive.*

It may be desirable for the contractor and the contracting officer to come to an understanding, first as to whether the contractor is obligated to make voluntary refunds of excessive amounts of partial payments (or is required to make refunds only upon

formal notice or demand of the contracting officer) and secondly whether interest should be computed from the date of demand unless the amounts are repaid within 10 days thereafter or from the date the amount became excessive (in the case of refunds due to material disposal credits or diversions not paid within the 10 day grace period).

The Net Settlement

Subcontractors' settled claims will ordinarily be paid by the prime contractor, after approval or ratification of the settlement by the contracting officer. It is customary for the prime contractor to require the submittal of appropriate invoices and documentation by subcontractors.

The prime contractor's claims will be paid by the Government after negotiation of the amount of net settlement, execution of a contract supplement covering the terms of the settlement and submittal of properly prepared invoices covering the net amount due the contractor under the terms of the settlement. The regulations require that a copy of the supplemental agreement covering the settlement must accompany the invoice.

The standard termination clause for fixed price contracts contains a requirement for retention of pertinent documents and records for a period of six years after the date of settlement. These records should be kept available for examination by the Government at all reasonable times for the duration of this period. To the extent approved by the contracting officer, photographs, microfilm, or other authentic reproductions may be used.

The contractor will be well advised to keep at least one manually signed and complete set of claim papers in his current files for each termination at least for the duration of the required retention period. It may also be desirable to prepare and retain a reconcilement showing the relationship of the claim, as submitted by him to the contracting officer, with the settlement negotiated, together with any pertinent commentary or important features which entered into consideration during the negotiation of the settlement.

Keeping Useful Records of Government-Owned Facilities

by A. J. VANDERBEEK

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Purchasing procedure for equipment of the United States Government is recounted in this article and also record-keeping for the same type of equipment in service, to the point of sale or scrapping. The text, dealing with organizational steps, is, nevertheless, very readable and pointed up as to the significance of the procedures described.

THE PURCHASE of facilities on behalf of the United States Government is of extreme importance to all companies engaged in manufacturing for it. Prompt reimbursement of costs is the chief interest of the financial departments. Reimbursement has a direct bearing on the methods used in recording company costs. This article, although not a working procedure, represents a method which is being successfully used by a company, the entire manufacturing effort of which is directed toward the manufacture of engines for the ordnance departments of both the Army and Navy. The procurement and disposal of machines will be discussed as being typical of all facility purchases.

Acquisition of Facilities Needed Under Contract

First, the need for machines must be covered by a contract, either in connection with the contract for a manufactured article or a special contract which authorizes the purchase of machines. Both methods have been used successfully. The master mechanic makes the initial determination as to what kind of machines are required. He issues a form known as a "request for use of government owned equipment", or more commonly "the request". This request states briefly the description of the machine, accessories which are required, and the use to which the machine is to be put. The request is approved by plant management and is forwarded to the property accountability department which supplies additional information regarding the contract and assigns a machine number and shipping information, if available.

The request, in triplicate, is presented to the ordnance officer assigned by the government to administer the contract under which the machine is to be purchased. This representative of the ordnance department is known as the contracting officer and represents the Government in all matters regarding the contract. He screens the

request against unused government machines located in warehouses or those which have been declared surplus by other companies. If a substitute machine is available, the master mechanic is notified. He makes an investigation into the conditions of the Government-owned machine and the costs which will be involved in reconditioning it to meet his needs. If he is satisfied that the machine will answer his needs, he withdraws the request and replaces it with a requisition for government-owned equipment, which is forwarded through the contracting officer to the warehouse or plant in which the machine is being stored. If the machine is still available, it is shipped into the plant from the storage area.

However, in the event no substitute machine is available or suitable, the request is approved by the contracting officer pending availability of funds from the contract. The master mechanic is notified that his request has been approved. He then prepares a request for authority to expend funds from the contract. This request is forwarded to the factory controller who determines the availability of money for the purchase and presents it to the company's finance committee for its consideration and approval, providing, of course, that sufficient funds remain in the amount covered by the contract. Incidental expenses, such as freight and installations are also included in the authorization request. This is done in order that the accumulation of all costs will be consolidated in one request. This greatly simplifies the process of reimbursement.

Now that approval has been obtained from plant management, the contracting officer, and the finance committee, the procurement of the machine is in order. The master mechanic, upon notification that funds have been set aside for his purchase, issues a request for a purchase order from the purchasing department. This department reviews the requisition and obtains quotations from suppliers of the machine and issues the purchase orders to the supplier with the lowest quotation. In the case of machines of a special nature, the master mechanic specifies the source of the machine. The purchase order is then sent directly to this machine builder. Purchase of machines for the Government is done by special purchase orders which are completely separate from other purchases. All labor and miscellaneous materials required incident to the installation of machines are also segregated, by the use of special work orders. Particular pains are made to see that costs of each machine are kept separately.

The Historical Record and the Card File Record

The maintenance of records, which form a very important part of any activity in which the Government is con-

cerned, is vested in the property accountability department the special function of which is to keep accurate and up-to-date records on all material being held in the plant for the account of the United States Government. The key document covering all property is known as the historical record. This form contains a record of all transactions which have taken place concerning each machine, the date it was originally procured, by whom, the initial cost, any basic changes made to it, all accessories which may have been attached, all moves made from one place to another, and all installation costs. This record is kept on file in the property accountability department, together with all related correspondence and maintenance records. A list of all tooling assigned to the machine is also kept with the record.

An equipment card file is maintained, which is the working file of the department. One card is assigned to each machine, stating very briefly the same information which is described more completely in the historical record. These cards are kept on file in numerical sequence by their machine numbers. A cross index is maintained to all accessories, which bear numbers of their own.

Upon receipt of a machine in the plant, it is immediately moved into a special designated area for preparation of receiving reports and inspection records. The master mechanic is notified that the machine is ready for installation. The proper work orders are issued and the machine is moved into production area. Procurement procedures have now been completed. Subsequent records of maintenance and movement throughout the plant are recorded by the property accountability department.

Equipment for Sub-contractors

Machines purchased for use by subcontractors are procured in much the same manner as described above. There is one exception. The determination for the need of the machine is made through negotiations between the purchasing department and representatives of the prospective sub-contractor. When negotiations have been completed, the requests are sent to the master mechanic who performs a survey of machines in the plant which might be used by subcontractor. If none are available, he proceeds in the same manner as has been described. The machine is, of course, shipped directly into the subcontractor's plant. Receipt of the machine is acknowledged on special forms sent to him for this purpose. Historical records are prepared from this receiving report. Records are then maintained in the same manner as set forth above by the property accountability department.

When the Equipment Is No Longer Needed

Disposal of machines is necessary upon completion of contracts, engineering changes which render a ma-

chine obsolete, or exhaustion of machines through long and continuous use. The property accountability department again is called upon to carry through with the necessary procedure, this time to seek relief of accountability for the machine. Upon notification from the master mechanic that a machine is no longer required or is unusable, this department notifies the disposal section of the Service's department of ordnance that the machine is no longer required. The form used for this purpose gives a description of the machine, a statement regarding its condition, and a recommendation as to the proper method of disposal. The property officer may or may not follow the recommended disposal, depending upon his own inspection of the machine. If in usable condition, the machine is placed on a surplus listing and is available to any company holding government contracts. If upon his inspection, the property officer decides that the machine is not usable and reconditioning costs would be expensive, he may order it disposed of as scrap. Requests for quotations are then forwarded to at least three scrap dealers and the machine sold to the one with the highest bid.

In regard to a machine in usable condition, the machine is ordered prepared for storage and is shipped into a warehouse under the jurisdiction of the Government property section, and relief of accountability is given the company. In either case, sale or storage, all records regarding the machine are sent to the property officer for his files.

Better Relations with an Important Customer

We have attempted, in a very brief way, to follow the steps used by one company in connection with the use of government-owned equipment, explaining the paper work required. To some, this may seem like a great deal of duplicated and wasted effort. However, several years of experience have resulted in development of the method described and, by following the requirements of the contracting officers and auditors to the letter, have made for better relationship and prompt reimbursement of costs.

Letters to the Editor

ACCOUNTING IS A COMMUNICATIONS TOOL

Editor, N.A.C.A. Bulletin:

THIS LETTER is aimed at bringing a few phases of the communications problem into focus, in so far as the accountant is concerned. It will deal with four points with respect to which he, and only he, can take the necessary steps to make the communications better. These points are:

1. The accountant's communications with people outside of the company (by financial statement)
2. The accountant's communications with the people inside of the company, (by internal reports)
3. The accountant's communication in the form of instruction to those who gather the data and prepare reports.
4. Communication between departments, where it is the duty of the accountant to coordinate their efforts.

Before going further, it will be advisable to have a definition of communications. It is very simple. The dictionary says, "Communication is the act of making oneself understood." The difficulty is in securing the result.

In the field of financial statements, the accountant is somewhat limited as to form of communication, due to tradition and legislation. However, because form has been largely predetermined, does not mean that all the matters of communication have been solved. As to financial statements, themselves, novel forms, which cannot always be used either for contacts with a bank or with the enforcement agencies of the government, are quite popular in published annual statements and in information statements given to both the stockholders and the public. There is a definite place for such improvements because balance sheets and profit and loss statements have notoriously been difficult to read and understand. Whatever steps are taken by accountants cannot help but improve the communications of the company to outsiders. There is also policy as to inventory valuations, depreciation methods, sales and sales deductions, reserve accumulations, and many other matters. The accountant must help decide which of the many methods is to be used and then use it exclusively. There are continual borderline cases. The accountant must assume the responsibility of seeing that these borderline cases are resolved within policy.

The second phase of the accountant's communications function concerns internal reporting. The accounting office is, and must be, a creative communication center. It is the collection point of all kinds of information from all sources in the company. The comptroller and his staff collect, sort, classify, analyze, and finally, dispatch the information either up or down the management ladder to the points at which it can be used promptly and effectively. It becomes increasingly important that the controller learn the lesson so generously supplied by the editors of newspapers in reporting interestingly. The accountant knows the techniques of recording yet he has not been devoted to conveying understanding. No one method is best in all situations, nor is consistency a virtue if it does not achieve results. Each issue of a report and each reissue should be subject to scrutiny to make certain it will achieve the objective. The form should be that which highlights the major point being made. The summary should briefly give the complete story. The detail, if necessary, should support the summary in an under-

standable manner. Still more important, the report must give consideration to the bias of the recipient. There must be a recognition of the fact that an item is looked upon from an entirely different point of view by each one of the persons in some way related to it.

The third field of communications for which the accountant has responsibility lies in the field of issuing instructions. To meet it, there should be a dictionary of accounts in addition to the chart to give in complete detail all of the information regarding entries. This dictionary of accounts can be compared very directly with a dictionary of words, set up so that there will be an exact meaning for each word, i.e., a good ground work for communication. In particular, in the issuing of instructions, the accountant will find that he must often issue instructions to people other than those in the accounting department. This is a particularly difficult type of communications for an accountant. He has learned that consistency is a virtue and has a hard time tailoring instructions to make himself understood by those who are not accountants. However, in the instruction type of communications, there is one help which is not so easily available in most other types of communications. This is the follow-up of the instructions (internal control) to see that communication was achieved.

The remaining field of particular importance to the accountant in the field of communications is the interpretation of programs and policies set by top management, which are to be followed by the various divisions in the company. In preparing the forecast and budget program, the accountant should consider the remarkable opportunity he has to communicate to all parts of the business the knowledge he is able to secure from being the center of the communications system. Many steps have been taken but this whole field still offers a great opportunity for constructive action.

Accounting is a tool of communications. The whole purpose and aim of accounting is to develop an understanding of a complicated and complex business situation. Thought and attention must be given to this ultimate goal.

GEORGE R. WHITE

TO TECHNICAL COMPETENCE, ADD THE HUMAN TOUCH

Editor, N.A.C.A. Bulletin:

I WOULD LIKE to submit the hypothesis that not only do trained technical people avoid thinking about their personal development but, in addition, they do something less than an adequate job in communicating their thoughts and ideas to others.

Let us take a look at a hypothetical company and see if we can ferret out some of the dynamics in play between the various departments or divisions. The engineering department is concerned with the design of a product, manufacturing is concerned with the making of that product, sales with the selling of it, while accounting focuses on analyzing the general profit structure of the company in addition to providing check points and signposts. Further, let us overlook for the moment the traditional disagreements arising between sales and manufacturing, between manufacturing and engineering, and between the whole company and the accountants. Let us focus more upon the inherent aspects of the functions of the various departments and let us see if we can divide them into two groups on the basis of those relying on contacts with people and those relying on impersonal job aspects.

The sales department functions primarily in the area of trying to sell something to someone. The salesman must contact other people and persuade them that his product is the best available. He needs at least

a minimum amount of skill in dealing with people. To a lesser degree, perhaps, the manufacturing department also has to work with and through people. True, the lathe operator or the boring mill operator does not need much in the way of human relations skills, but a manufacturing foreman or superintendent has to work with people and through people. In brief, salesmen and manufacturing supervisors seem to me to rely quite directly on skills in getting along with people. I think that the engineering and accounting departments differ from the sales and manufactuirng areas in at least three ways: (1) they generally have fewer people, (2) they are generally more dependent upon facts and figures than upon human relations skills, (3) the personnel in the accounting and engineering areas are generally better (at least more intensively) educated than their colleagues in either sales or manufacturing. From the psychological point of view, the relatively intense and concentrated education and training of accounting people, coupled with the technical demands of the job, raises some interesting questions (the same questions can be asked of engineers.) The questions are these: "Does the well-trained accountant use his personal ability as efficiently as he uses his technical ability? Does he tend to rest his case primarily on the facts and figures? Is he careful to convey a personal message when he is communicating his conclusions? Does he lead the horse to water and try to make him drink—when he should first make him thirsty?"

The problem is one faced by all trained specialists. It is no small task for these men to learn to think in different ways than they have previously. It is not simple to shift from a tightly analytical approach to a broader outlook. It is quite difficult to change from dealing with tangible, quantitative, and specific matters to broad, vague, and intangible ones. It is not easy to understand what it is like to deal with complex and ever-changing intangibles which defy quantification. The matter of attaining greater personal breadth and wider intellectual horizons is especially important to me as a consultant because those are the characteristics of managers and executives. I would like you to think for a moment of the complex responsibilities of a company president. Some of the decisions he has to make are fairly simple, but the major decisions often have to be made, when all is said and done, on hunches, dreams, and wishes. The art of management has so far defied even definition.

I would be very much interested to see some figures indicating the number of company presidents who have come up through accounting, actuarial, underwriting, and statistical departments. It is my guess that disproportionately few of them have done so. However, it would seem that the intellectual requirement and the orderly and logical thought processes required of accountants and controllers would prepare them admirably for these complex responsibilities.

I would like to urge industrial accountants to make the most of their technical training, but also to master it. In reports, remember that you are communicating to another person and that the extent to which you get through is in many ways directly proportionate to the keenness with which you appraise the receptivity of your listener. There is no communication unless there is a sender and a receiver. The sender and the receiver must both be on the same wave length and the message received must be the same as the one sent.

JAMES W. ROHRER

Notes on Current Reading

Books

Bibliography

Suggestions for An Industrial Accountant's Library (Multigraphed list available from N.A.C.A. Technical Service Department)

This informal listing is not in the nature of an official publication of N.A.C.A. but embodies the response given when inquiry is made of Technical Service for a classified list of books which might serve an industrial accountant to assemble a collection pretty well covering his own and a number of allied fields. As its headnote specifies, it is a list of "suggestions only." More than 150 titles (with authors, publishers, and present price) are given under more than 30 classifications, such as "Accounting," "Cost," "Distribution," "Inventories," "Management, General," "Mechanical and Electronic Equipment," "Reports," "Writing," etc., etc.

A list which stands as fore-runner to the present one was prepared some four years ago. It was revised early in 1955 and has again been revised as of last May. Publication dates of books included are, for the most part, 1950 and later years, although it has naturally been appropriate to retain a fair number of earlier works. Publishers' addresses are appended, as are also the addresses of principal periodicals in the accounting field, together with a few others.

S. E. C. Accounting Practice and Procedure

Louis H. Rappaport, Ronald Press, 15 E. 26th St. New York 10, N. Y., 1956, 555 pp., $15.

A comprehensive and experience-based treatment of its subject by a partner of a public accounting firm who has made the accounting aspects of security registrations his specialty, this work deals with the several laws which the Securities and Exchange Commission administers, the regulations it applies, and the forms it requires. The widely applicable Form S-X is presented and annotated.

27th National Cost Conference

Institute of Cost and Works Accountants, 63 Portland Place, Paper Bound, 1956, London W1, England.

In separate pamphlets, one giving the address of the retiring president and the other presenting the two technical papers delivered before the conference, the published proceedings of the Institute of Cost and Works Accountants annual gathering in Edinburgh May 31 to June 2, 1956, evidence emphases also apparent in N.A.C.A.'s meeting of a month later. The "presidential address" touches on national policy (English), automation, and the place of the cost accountant. The technical addresses—by title "The Impact of Automation on Management Accounting" and "Looking Forward"—tend to parallel the foregoing themes and deal, respectively, with automation in plant and office and with management problems and the relationship of management accounting to them.

The Theory and Technique of Cost Accounting in the Hosiery Industry

A. Weyman Patrick, University of Michigan, Ann Arbor, Michigan, 1956, 229 pp.

Described prefatorily as a "monograph . . . developed from a doctoral dissertation," this full-length book is also identified as Volume XII, No. 3 of Michigan Business Studies issued by the Bureau of Business Research of the University's School of Business Administration. There is historical background related to the industry and the "study of costing begins with the knit-

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE CONTROLLER, *July* 1956 (2 Park Avenue, New York 16, N. Y., single copy $.50)

Long-Range Planning. Robert C. Tait.
The Operating Budget. John M. Thompson.
The Controller's Role in Collective Bargaining. Maynard F. Carter.

COST AND MANAGEMENT, *June* 1956 (31 Walnut St. So., Hamilton, Ontario, Canada, single copy $.50)

The Importance of the Time Factor in Investment Decisions. C. G. Edge.

JOURNAL OF MACHINE ACCOUNTING, Systems & Management, *July* 1956 (6109 N. Karlov, Chicago 30, Ill.)

Accounting and Management Controls in the Machine Accounting Department. Charles F. Clayton.

ting operations and continues with a discussion of pertinent problems in each manufacturing process. . . ."

Case Studies in Auditing Procedure — A Hospital

American Institute of Accountants, Committee on Auditing Procedure, 270 Madison Avenue, N. Y. 16, N. Y., 1956, 43 pp., $.50.

The continuing interest in techniques of accounting for nonprofit institutions, especially hospitals and like institutions, is met in part by the present study, despite its emphasis on auditing, largely because it suggests and outlines a review of accounting procedures. Among these are cash, billing, credit, stores, inventory, plant, investment, purchasing and payroll procedures, as well as those related to free service and out-patients.

Financial Management in Industry

A Series of Talks by Leaders in Industry, Headquarters, U. S. Air Force Deputy Chief of Staff, Comptroller Executive Development Program, 1955, 50 pp., Not for Sale, Limited number of copies available.

Recently received, this group of addresses accentuates the trend toward industrial-type management (with the corresponding needs) in the armed services and also comprises statements of fundamentals by seven financial executives representing a diversity of companies.

A Study of Industrial Retirement Plans — Including Analyses of Complete Programs Recently Adopted or Revised.

Bankers Trust Company, 16 Wall St., New York, 1956 Edition, 177 pp.

It is stated introductorily that "this is a study of employee retirement plans of industrial employees for the period 1953 through 1955. Its purpose is to show the current . . . practices of large and small employers in various industries . . . it is based on the new plans and the amendments to old plans. . . . Five previous studies covered . . . practices . . . 1943 through 1952." Much detail is given for individual plans and in a form for comparison among plans.

Articles

Cost Justification Under The Robinson-Patman Act

Herbert F. Taggart, Journal of Accountancy, June 1956.

The author's recent three-year chairmanship of a committee advisory to the Federal Trade Commission in the area of this article's topic makes the presentation of special interest. Professor Taggart traces the work of the committee and describes its recommendations. Both cost justifications

SELECTED ARTICLES FROM BUSINESS PERIODICALS

ADVANCED MANAGEMENT, *June* 1956 (74 Fifth Ave., New York 11, N. Y., single copy $.75)

Management Development in Small Enterprises.
Small Business Plans for Profit. Wilford L. White.
Marketing—Last Frontier of Scientific Management. Charles W. Smith.
Recommended Readings for Small Businessmen.
*Coordinated Management for Small Business. Clifford C. James.
Is Small Business Managed? Phil Carroll.

HARVARD BUSINESS REVIEW, *July-August* (Soldiers Field Station, Boston, 63 Mass., single copy $1.50)

Protect Your Records Against Disaster! Robert A. Shiff.

OFFICE EQUIPMENT NEWS, *June* 1956 (146 Bates Rd., Montreal 8, Canada, sing' copy $.35)

How Management and Office Efficiency Were Materially Improved at Imperial Tobacco Co. R. A. Hillhouse.

*Further mentioned in accompanying notes on particular articles.

and cost presentation procedure are involved in these recommendations. With respect to the latter, it is commented that "no logical approach to cost justification should be ruled out simply because it is found to be nonconformable to . . . procedure."

Coordinated Management for Small Business

Clifford C. James, Advanced Management, June 1956.

Under a side heading "Small Business Essentials," there are given in this article 10 factors and well-detailed subfactors involved in managing a small business, followed by a recognition of specific details —again numerous—involved in planning, building, and controlling the enterprise. No manager reading these lists will doubt the weight of his task, nor is he likely to doubt its manageability if suitably organized.

Management Can Understand Operations Research

Van Court Hare, with Ram Vazwani, Management Methods, May 1956.

Perhaps a dozen and a half questions and answers constitute this article. Most of them deal with "linear programming" as the phase of operations research most pertinent to solution of pressing managerial problems. Several of the questions to which compact response is given are: "What problems can linear programming handle?" (examples given involve allocation of scarce resources), "Can computations be mechanized on an electronic computer?" and "What basic information is needed?"

For Your Information

DATA PROCESSING — ONCE AGAIN

FOR THE THIRD, and probably final, time these pages are devoted to one of the current presentations of integrated data processing and the use of electronic computers, which are intended to "break in" the less initiated of us (a numerous group, indeed) to the technical basis and practical application of advanced computing equipment. The indications in this space of contents of full-scale books on "electronics" (Howard Levin's in July and that by Messrs. Kozmetsky and Kircher in August) were, very broadly speaking, a type of reference material related to articles in the same area published in the *N.A.C.A. Bulletin* of those months. It is somewhat similar with this issue. In Section 3 will be found three digests of proceedings of discussion groups held at the Annual Cost Conference in Chicago, reflecting informal but fairly extensive consideration of data processing problems now faced by companies large and small. In the present paragraphs is given a condensed description of a compact and systematic exposition of computers and their services.

A Compact Summary

Without comparing merits, it may be said that it is probable that the reader can get to the essentials of the matter more quickly in *Electronics in Business Management*" by Charles M. Moore and Thomas M. Humble, with the collaboration of H. H. Chapman (Printed Series No. 2 of the Bureau of Business Research of the University of Alabama, University, Alabama) than from either of the two previous works mentioned. The latter, as already seen by readers of the *Bulletin* are regular-length books of an introductory character. The nature of the presentation by Messrs. Moore and Humble is, rather, a summary of the topic, although an extended one. Hence, although the reader will get to the central aspects of computer construction, operation, and application more quickly, he must be prepared to face difficulties of understanding more quickly also, for no simplification can eliminate the intricacies, from an intricate subject. It can only introduce elements of clarity, whether by analogy with known concepts or progressive explanation.

How the Topic Is Treated

However, because *Electronics in Business Management* is shorter, it can perhaps be given more adequate description here, for the assistance of the many who are interested in all serious attempts to shed light on the topic. It is a paper-bound 82-page pamphlet with nine chapters mostly running less than ten pages apiece and well subdivided, together with appendices naming manufacturers of electronic data processing systems and presenting a bibliography of books and articles in the field. Four full-page charts appear in text, a set of three diagramming on the basis of a simple computation the elements of data processing by, respectively, "human effort," a "desk calculator" and an "electronic (automatic) computer." The fourth chart appears at a later point in the pamphlet and diagrams "the functions and basic units of an electronic data processing system."

Although, as indicated, it is possible to deal somewhat differently here with this exposition, it may be helpful, first, as with the other texts described, to note the chapter titles in which the same genuine characteristics of sign-posts-pointing-to-simplifi-

cation (for which we may be grateful) are evident. These titles, with section titles where supplied, are:

1. *How Electronic Computers Came to Be*
2. *What Electronic Computers Can Do*
3. *Some Definitions* (Definition of an Electronic Computer, Basic Components of Computer-Systems, General-Purpose and Special-Purpose Computers, Internally Programmed Machines and Externally Programmed Machines, Electronic Computer Language, Programming, Feedback)
4. *How Computers Operate and Some Number Theory*
5. *Why Business Needs High-Speed Computers*
6. *Applications to Business Routines* (Applications by the U. S. Bureau of Census, Applications by Private Business Concerns)
7. *Application to Business Research and the Analysis of Business Problems* (Forecasting and Time-Series Analysis, Special Surveys, Cost Distribution, Sales Analysis, Mathematical Programming)
8. *Probable Impact of the Electronic Computers* (Probable Impact on Business, Probable Impact on the Economy, Probable Inpact on Education)
9. *What to Do About It*

The remainder of this indication of contents will attempt to run a thread of quotations through the foregoing chapters to indicate more in particular the nature of each and of the whole. It is not possible to do more than to so indicate, nor would it be permissible. The quotations will be individually brief and will be in the form of review-type excerpts as related to each chapter, to provide a basis for discerning the serviceability of the text. The quotations are as follows:

(from chapter 1) "The two lines of development . . ., the digital desk computer and the punched card tabulater, provided means of doing relatively difficult single computations, and of handling summarizing of detailed data. The distinct feature of the new electronic computers is ability to perform the sequence of the operations needed. . . ."

(from chapter 2) "While the machines in their physical structure are extremely complicated, the functions that they perform are neither new nor strange . . . A simple problem in computation will be used for illustrative purposes. Three methods . . . will be explained: (1) by human effort (plain arithmetic), (2) by the use of desk calculators, and (3) by automatic electric data computers."

(from chapter 3) "An electronic digital computer is a calculating machine for solving directly numerical problems. . . . The machine accepts data and instructions coded in the form of discrete digits which are converted to electrical impulses. The data are processed without any further human intervention, according to instructions, and the results converted back to digit form."

(from chapter 4) "The binary system of numbers has been found to be the most convenient . . . for electronic digital computers because it is very easy to let an electrical impulse represent one of the binary digits (1) and the absence of an electrical impulse represent the other binary digit (o) . . . with this limitation it (the computer) can read and act at almost incredible speeds."

(from chapter 5) "The subject will be divided into two fields . . .1. Applications to mass paper-work jobs . . . -payroll accounting, inventory or stock control, customer billing and accounts receivable, and similar problems. 2. Applications to problems of analysis of business data."

(from chapter 6) "In data processing, the time and cost required by an entire process—from the first record of a transaction to the final report . . . is of primary concern. . . . The experimentation with common-language tapes . . . and high-speed printers . . . are of very great interest and possible importance."

(from chapter 7) "With the advent of electronic digital computers . . . cost accountants may find it advisable to change their practices with regard to reciprocal cost transfers. . . . The only difficulty is that the accountant who writes the equations and the detailed instructions must know thoroughly his college algebra."

(from chapter 8) "Several approaches to meeting the needs of small concerns seem to be under consideration. (One company) has several models . . . operated from punched cards . . . another approach is the combining of units which are now in common use with new devices in such a way as to secure continuous processing of transactions and simultaneously to produce the various records of business papers needed."

(from chapter 9) "The first decision should not be a do-nothing proposition. The investigation can prepare the way for improvements in procedures, further development of routines and mechanization, and perfection of office organization."

Yes, What to Do About It?

Many industrial accountants, when they have read a good deal about electronic computers, will begin to ask themselves a question about which even the authors of textbooks and summaries seem to show a degree of uncertainty. The question is, "Just what do I *have* to comprehend?"

As to the workings of the computer—its use of electrical impulses and binary arithmetic—there is some reasonableness to the point of view that these are less relevant matters (like the wheels and gears of an adding machine or the lens structure of a photo-copyer), so long as the machines can take decimal arithmetic input and produce it in output. Nevertheless, these matters are points of high curiosity and many will find their own concepts of data processing more flexible, once they have tried to "wrap" their minds around a different use of digits and the scarcely comprehensible speed of calculations made.

It is not entirely clear whether or how far the accountant should let himself be led into an attempt to refresh himself in mathematics he once knew and perhaps branch out in this field and whether he should familiarize himself with scientific methods —especially problem solving methods like those identified as operations research. There are a wide range of "to study or not to study" choices but, here again, there is a provocative horizon and a broadening effect as the uses of business information, contemplated by these methods, are viewed.

With respect to programming of computers, it is unlikely that industrial accountants will miss the new significance of this specialty. What was merely technical with respect to tabulating installations is of central significance to the use of electronic equipment. Here is centered the intelligence which directs these robots into extended task sequences which result in the integration or automation of data processing expected to be so useful in management. It seems to be conceded that programming is the brain of the automatic brain and that, without intelligent programming the entire concept is a procedural "dud."

It will be apparent also that data which has been gathered forms the raw material of the processing. Here again, a new significance becomes apparent, which the industrial accountant will not miss. The idea of data turns out to be a very expansive one. It is needed, to a greater extent, all at one place and time, rather than in gradual accumulation through the accounting process as uses for additional description and detail become known. As with programming, so the assembling of data to be processed calls for a new element of foresight and a new requirement for inclusiveness.

Firm Ground

Perhaps, before one permits one-self to feel all at sea in these matters, it will be helpful to anchor to one comforting thought. Nothing has changed about the subject matter of accounting. The transactions are the same. All new concepts can do is to add depth, breadth and length of perspective to the extent of the usefulness of this information.